THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1925.] LONDON, APRIL 3, 1900. [52ND YEAR. PRICE 6d.

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Yield of Gas per Ton . . . 10,500 Cubic Feet.
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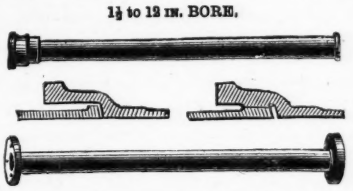

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FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

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THE Utilization of Towns' Refuse for some practical purpose has been successfully solved; and there is, therefore, no reason why every township should not have its own Electric Light Installation, and obtain the power from its Dust-Bins.

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DARWEN, LANCS., 8 cells; 2 Lancashire Boilers, 30 feet by 8 feet—200 lb. pressure.

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WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

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With Improved Centre-Valves, to work either One, Two, Three, or Four Purifiers at one time.

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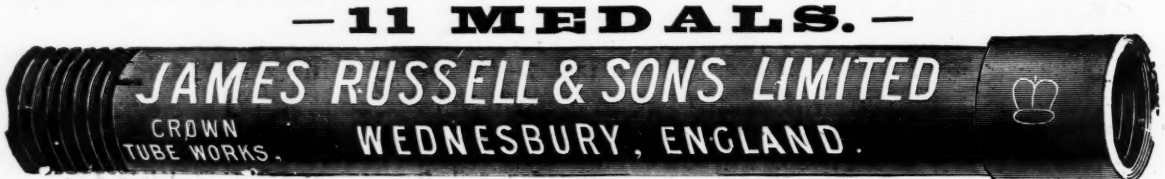

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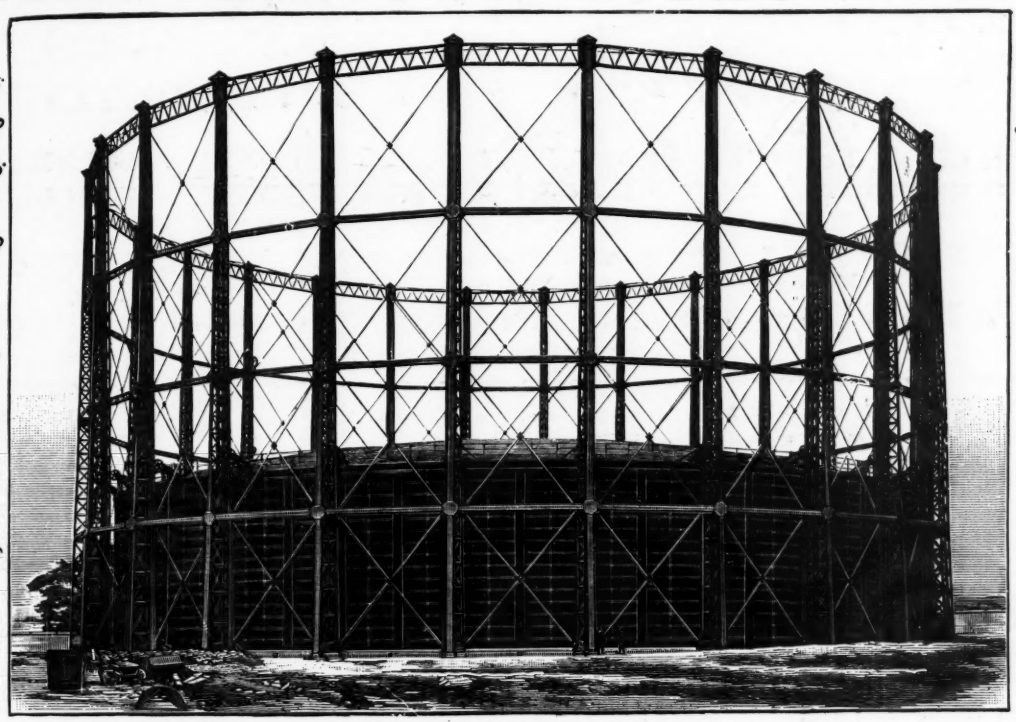

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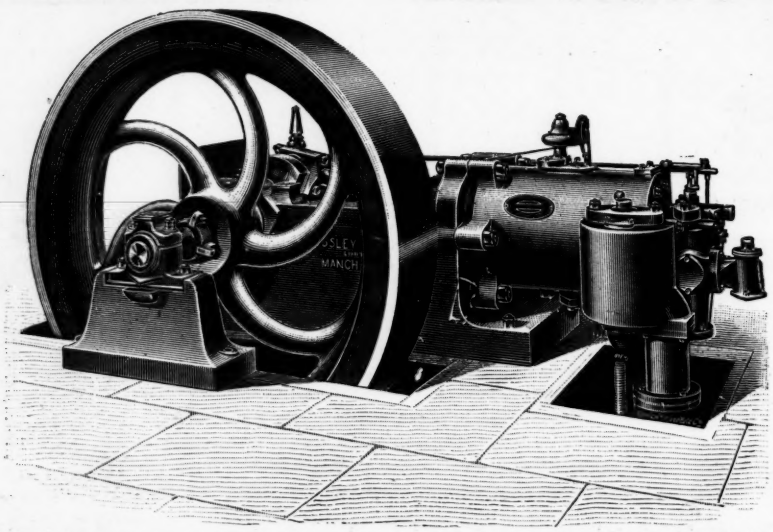

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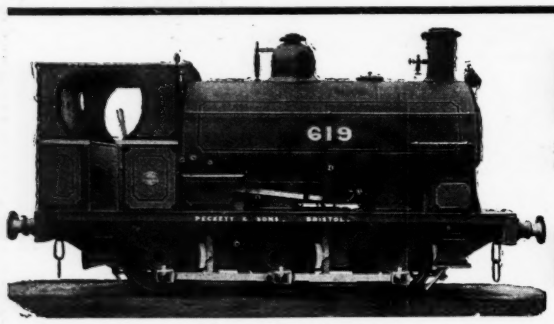

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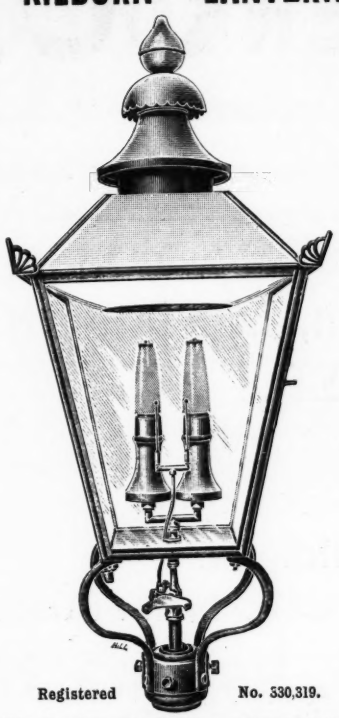

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STEEL OF ALL DESCRIPTIONS.
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FOR
GAS PURIFICATION.
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.
Full Particulars on application to the Patentees:
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NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
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INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
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CANDLE SAFETY LAMPS
Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7, or 9 hours.
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COKE-BREAKERS,
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PAINTING BY MACHINE.
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Painting Speed—3 Square Yards a Minute.
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Paint Machine, attached to a Single Air-Compressor, Driven by Belt Power. Can also be driven from existing Air-Mains.

No. 1	Painter	£25	Single Air Compressor	£17	10
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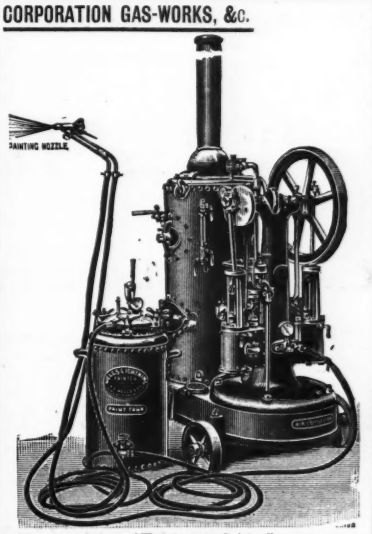
THE GASLIGHT AND COKE COMPANY, THE SOUTH METROPOLITAN GAS COMPANY, THE GLASGOW, BIRMINGHAM, PRESTON, BURSLEM, WARRINGTON, LIVERPOOL, NOTTINGHAM, OLDHAM, STOCKPORT, AND WEST BROMWICH CORPORATION GAS-WORKS, &c.



Vertical Steam-Engine and Air-Compressor combined with Boiler on Wheel Base.

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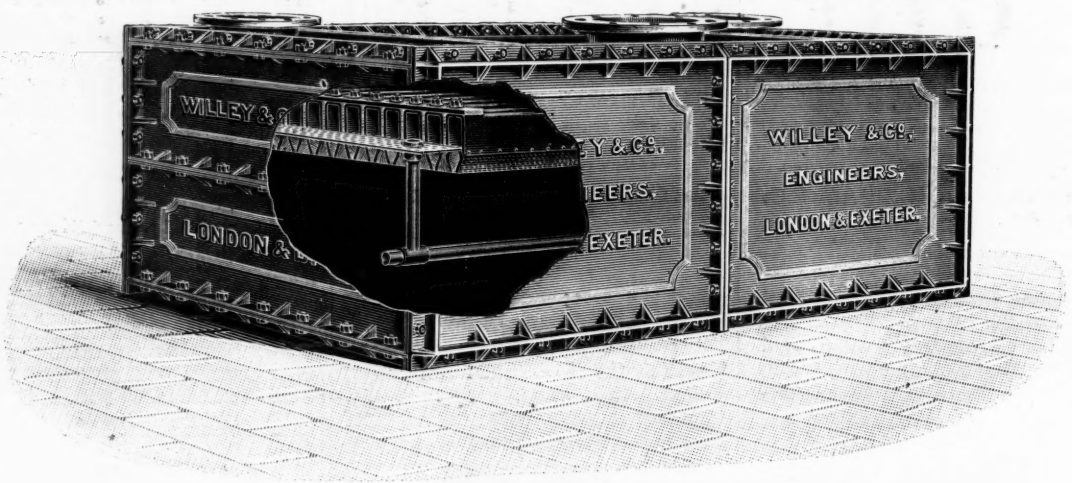

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Manufacturers of

GASHOLDERS, PURIFIERS, WASHERS, and every description of Gas Plant.

Improved Gas Governors, Station Meters, Consumers' Meters, Gas Apparatus, and Gas-Fittings.

SPECIALITY.

Prepayment Meters for any coinage, unexcelled for Accuracy and Reliability.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

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We Undertake Contracts for Complete
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with all the Latest Improvements,
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THE MOST SATISFACTORY INSTALLATION
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INSTALLATIONS ERECTED FREE FROM ROYALTIES.

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PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

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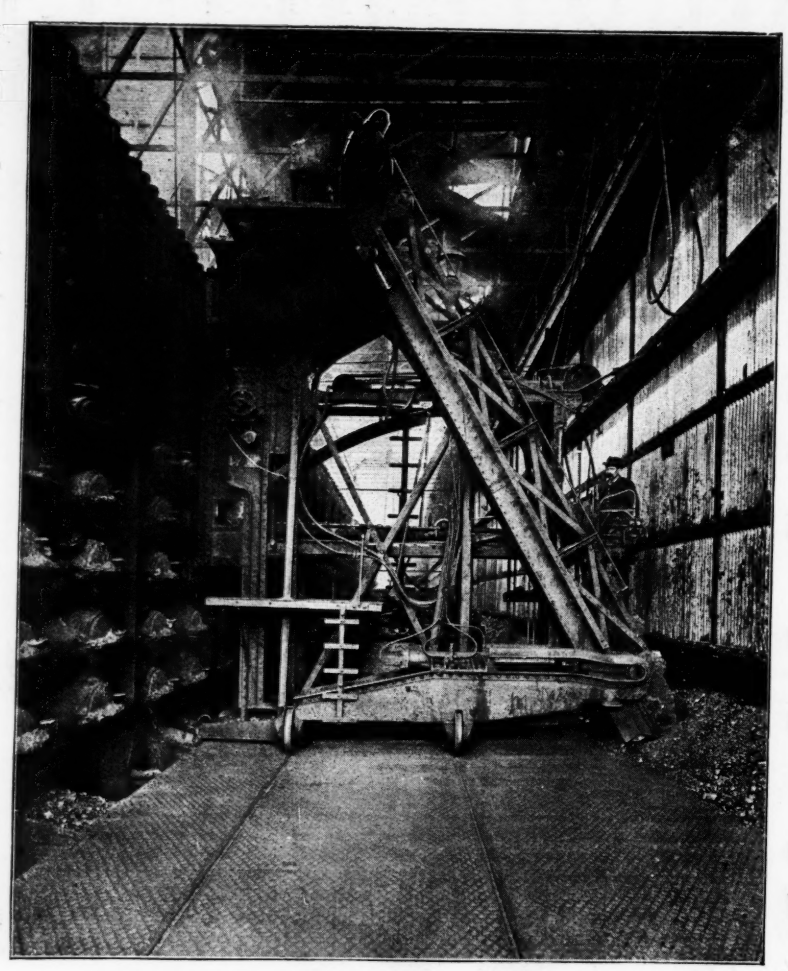
BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.



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BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
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HAGUE CORPORATION GAS-WORKS—
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METROPOLITAN GAS-WORKS—
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CLEVELAND GAS-WORKS—
Cleveland, Ohio,
&c., &c., &c.

OVER 200 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

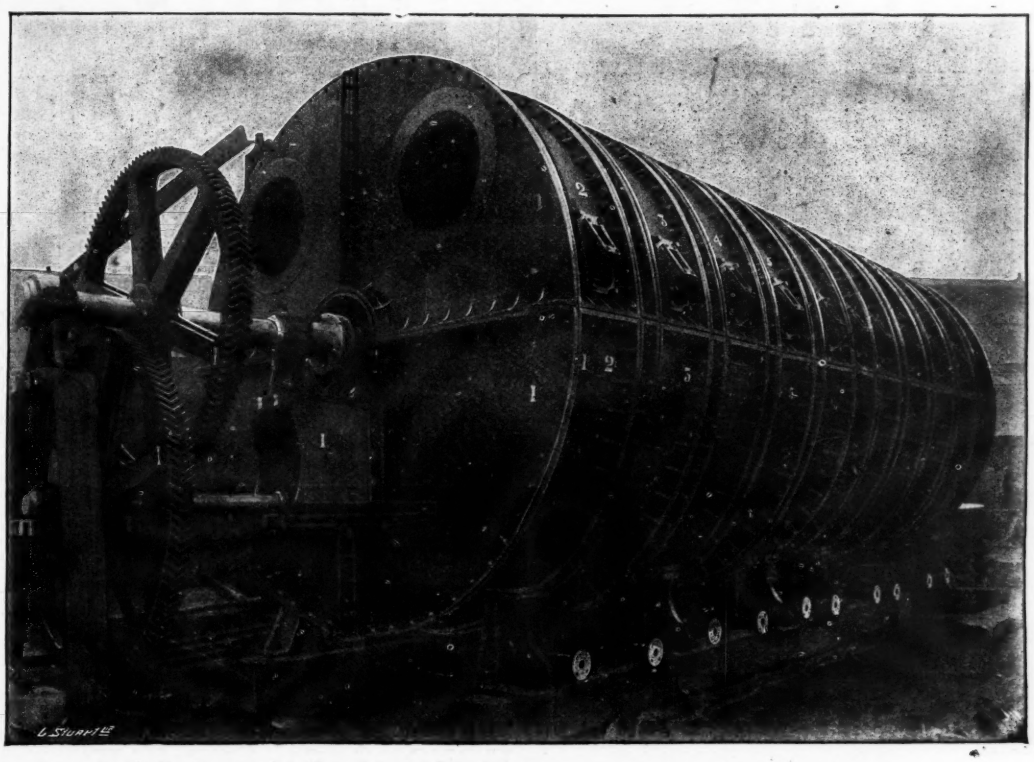
ROTHERHITHE GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

ONE MINUTE.

PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.

NOTE: Orders already received in **1900** for MACHINES to deal with **23,500,000** cubic feet of Gas per Diem.

ADDITIONAL ORDERS received WEEK ENDING MARCH 24 for MACHINES as under:—

SUNDERLAND GAS COMPANY, BISHOP AUCKLAND GAS COMPANY, TYNEMOUTH GAS COMPANY, SELKIRK GAS COMPANY, BEVERLEY CORPORATION GAS-WORKS, HOLMFIRTH GAS COMPANY, COATBRIDGE GAS COMPANY, CARLTON IRON COMPANY, LIMITED (THIRD ORDER), increasing the total to

30,300,000 CUBIC FEET OF GAS PER DIEM.

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TELEGRAMS: "IGNITOR, LONDON." "HOLMES, HUDDERSFIELD."

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Telegrams: "Evans, Wolverhampton." PLEASE APPLY FOR CATALOGUE No. 8. National Telephone No. 7089.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

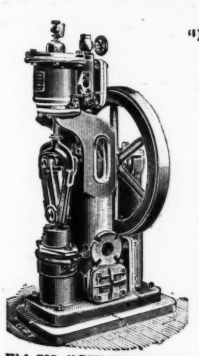

Fig. 705. "SINGLE RAM" STEAM-PUMP.

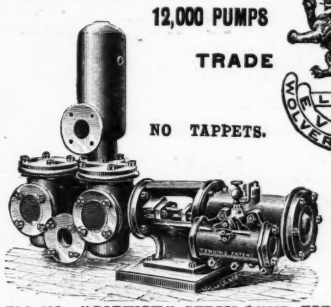

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

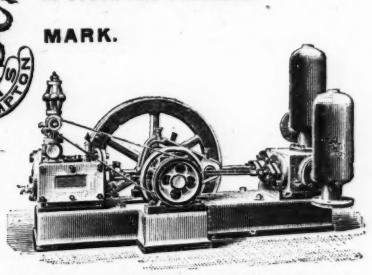

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

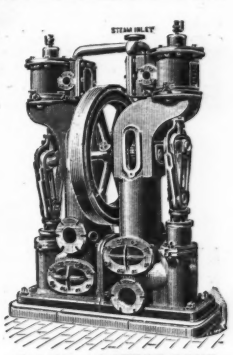

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

FRANK WRIGHT'S

PREPAYMENT GAS-METER CORPORATION, LIMITED,

Dry Gas-Meter Manufacturers.

THE ADVANTAGES OF THIS SYSTEM ARE--

1. Simplicity of Mechanism.
2. Absolute Accuracy.
3. Impossibility of being Tampered with.
4. Unaffected by any irregularities in shape or thickness of the penny.
5. Can be fixed to any ordinary Dry Meter.
6. Extra large Money-Box.
7. Price Changer can be altered without otherwise disturbing Meter.
8. Index showing the number of Pennies in the Mechanism at any time.
9. Rejection of Half-Pennies certain.

The Trafalgar Prepayment Gas-Meter

(FORSTER'S PATENT.)

Guaranteed for Five Years.

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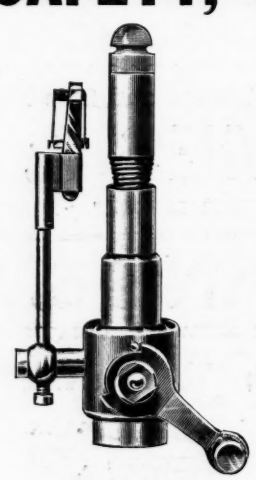

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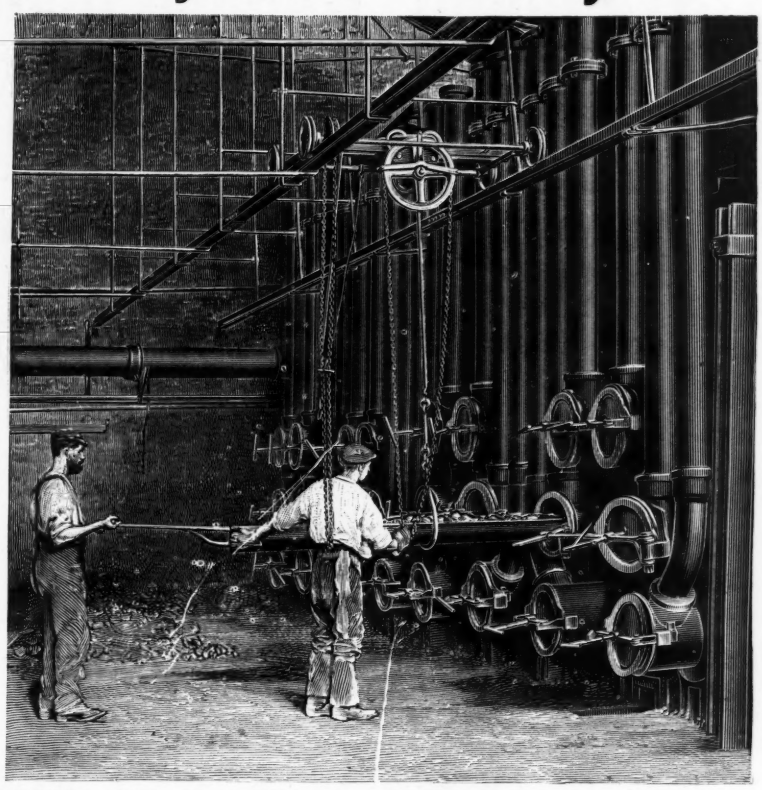

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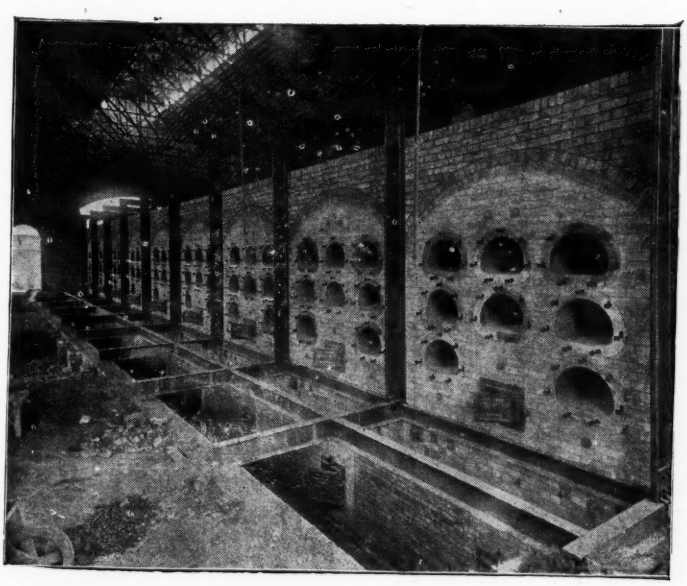

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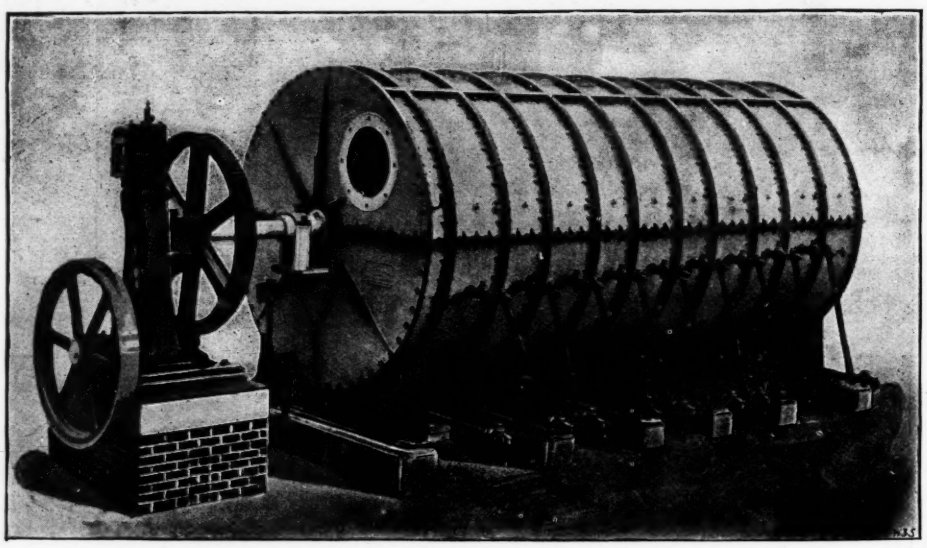

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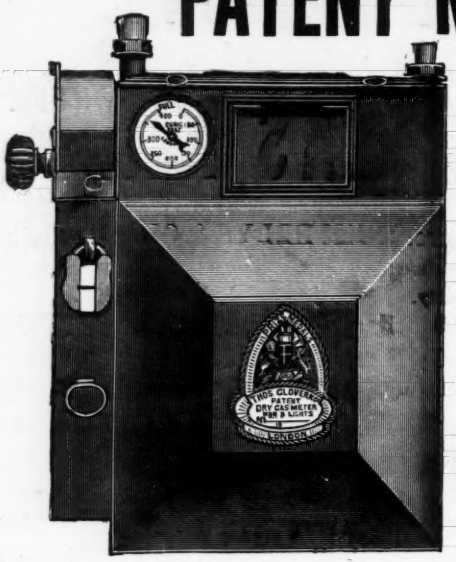

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EDITORIAL NOTES.

The Price of Coal and Gas.

THE financial outlook in the gas world for the ensuing year is not a bright one, as even the most optimistic of managers must by this time realize. It is true that the largest coal contracts have not yet been concluded; but the price at which the next twelvemonth's requirements will have to be bought—unless the coalowners can be induced to adopt a more reasonable attitude than that at present assumed—can be estimated with a fair approach to accuracy. We do not think that Durham gas coal is likely, as the market stands at present, to be bought for delivery over the coming contract year at much less than 15s. 6d. per ton, free on board in the port of shipment. That is equivalent to about 19s. per ton in the Thames, and would represent a rise of from 6s. to 7s. per ton over expiring contracts. Such an increase works out at a gross addition of nearly 8d. per 1000 cubic feet to the price of gas. Assuming such a tremendous addition to the cost of manufacture (and we see little prospect of its being substantially less), the vital question has to be considered, of what compensating increase may be anticipated in the return from the sale of residuals.

In attempting to form such an estimate—a calculation of no little difficulty—sight must not be lost of the fact that Gas Companies have during the past six months been reaping a considerable advantage from the improved condition of the residuals market. Coke especially has been fetching very good prices indeed. The contract rate for the supply to the cement manufacturers, which largely controls the London market, is now not far from double what it was some three or four years ago; while tar products (pitch in particular) and sulphate of ammonia have been selling well. We should not like to put the enhanced value of residuals for the year ending June, 1901, as compared with the return during the year to the end of June next, at more than 4s. per ton of coke sold, ¼d. per gallon of tar, and 1s. per butt of liquor; and, of course, it would be dangerous to place implicit reliance upon any such figures. The market in coke, especially, might easily be "foozled" through want of co-operation among the largest makers. The higher residual values set out would be equal to about 2s. 6d. per ton of coal carbonized, or 3d. per 1000 cubic feet of gas. On these hypotheses (which are purely speculative), those Companies whose ruling prices for gas are sufficient, and no more than sufficient, to pay their statutory dividend, would have to face an increase of 5d. per 1000 cubic feet before the year is out. What would the London householder—on the hither side of the river—say to a price of 3s. 3d.?

What are the prospects of the market becoming easier? With no desire to be pessimistic, we must confess to seeing little. In fact, at the present moment the tendency is rather towards hardening, owing to the stimulus to the demand for coal and to the consumption of gas afforded by the prevailing snap of biting cold weather. Gas coal is nearly as scarce as it was in mid-winter; and, so far from the Companies having been able to replenish their stocks, some at least of them are as near bottom as ever they were. Indeed, if, as we believe, our information be correct, the continuity of the supply of gas to the Metropolis at normal pressure has been more closely threatened during the past week from failure of coal deliveries than at any time for many years past. The effect of the cold weather is, however, necessarily but temporary; and every day brings the summer within more measurable distance. The question of importance is the view taken by colliery owners and coal factors of the possible situation next winter; and there is little doubt that they fully anticipate (and, so far as it is at present possible to judge, have good ground for anticipating) that, after stocks all round have been brought up to the minimum compatible with safety, the demand for coal in the next twelve months will exceed, rather than fall short of, the supply.

In attempting a careful survey of the prospect for the near future, it is necessary to bear in mind two considerations that offer strong inducements to the colliery proprietors to ask and hold out for heavy prices for ensuing contracts. The first is the strong upward tendency of miners' wages, the full effect of which is only now making itself felt. In the Federated districts, it is true, wages have for some while been fixed at their maximum; but

in the Northumberland, Durham, and South Wales fields the rise in wages follows some time after that in coal, and has hardly yet reached top figures. The result of the last audit of the books of the South Wales owners (published on Saturday) secures to the miners in that district an increase of 13¾ per cent. on standard rates—making a pay rate of 48¾ per cent. above the wages paid in 1879 (which constitute the standard). This is far and away the highest rate paid since the end of 1891, when it stood at 53¾ per cent. above standard; the lowest interim rate being 10 per cent. at the end of 1896. Miners' wages in all districts are now practically as high as—in some cases higher than—those ruling in 1890-1. Though, of course, wages follow on prices, and not prices on wages, the fact of such increases being obtained at the present moment is certain to stiffen the backs of the owners. The other consideration tending so to do is the fact that, although collieries have done exceedingly well during the past winter, they have by no means reaped the lion's share of the profits accruing from the extravagant prices obtained for the coal actually sold in the market during that season. These profits have, in large measure, been factors', not owners', profits—especially in regard to house coal, but also in regard to much of the gas coal purchased—and the owners are now intent upon securing for themselves the benefit of the excess demand. That is why we do not see much hope of an abatement in the exorbitant prices now being asked for the fresh contract supplies.

It is some small relief to an otherwise depressing situation to learn that the Railway Companies have abandoned their projected idea of recouping themselves for the increase in their working expenses, caused by dearer coal and materials, by imposing an additional carriage rate of 3d. per ton on coal to the South. Whether the Board of Trade would sanction the higher impost upon a commodity already by no means lightly charged for carriage by rail, is doubtful; but it is satisfactory to know that, owing to the refusal of the Company which does the largest coal-carrying trade to co-operate in the movement, the proposal has been dropped. The price at the pit's mouth has risen quite high enough to render particularly unwelcome an addition of 3d. per ton to the cost of bringing the raw material into the retort-house.

The Precedents of Glastonbury.

An extremely interesting and valuable piece of legislative work has been done by Mr. Schwann's Committee on the Glastonbury Gas Bills, as reported in another column. The settlement effected is a splendid testimonial to the efficiency of the British system of legislating upon such matters on the merits of individual cases. This system combines, in a wonderful degree, elasticity in dealing with particular considerations, with fidelity to worthy precedents. Thus the way is always open to statutory improvement; while there is ample guarantee that progress shall be real. Precedents are continually being tested, year after year; and the fresh minds brought to bear on successive Bills ensure a welcome for all fair and sensible suggestions. Moreover, the system offers facilities for obtaining solutions, of the deepest significance, of problems presented by small as well as big Bills. Human nature being what it is, the average man feels greater confidence in grappling with issues of moderate dimensions. He can see them completely, and see them whole; and in connection with such projects as the Glastonbury Gas Bills, the member of a Parliamentary Committee is less liable to be deterred by the minatory finger of a leader of the Bar from giving effect to his judgment, than when Counsel can solemnly warn the Committee against unsettling interests of vast and unknown importance. These general reflections arise irresistibly on a review of the proceedings in Committee on the Glastonbury Bills. The facts are simple enough; but the dignity of their treatment puts the Act that will eventually be passed in the foremost rank of gas legislation of recent times.

The Corporation of Glastonbury have a Bill for enabling them to acquire the undertaking of the Glastonbury and Street Gas Company, who originally had a Bill of their own. This, however, was withdrawn on the passing of the preamble of the Corporation Bill—the principals having agreed upon terms of transfer. Adjoining Glastonbury is the urban district of Street, the importance of which to the gas undertaking is indicated by the name of the Company. The Street Council naturally wanted to know how they would stand affected by the proposed transfer; and the Committee postponed consideration of the clauses in order that Street might examine them in the light of a proved preamble. The first point that Street fell upon was the usual formula which allows the application of the surplus profits of the undertaking to increase the district fund of Glastonbury. It was suggested that all surplus profits ought to go to reduce the price of gas, or else Street would be worse off under the Glastonbury Corporation than it would be under a sliding-scale Gas Company. Municipalizers should take note of this observation. Next, objection was taken to too large a reserve fund; but, although reasonable enough, the criticism was not very serious, inasmuch as Corporation gas undertakings are rarely troubled with excessive reserves. Of greater moment was the proposition that Street should be recognized as having property in the sinking fund; so that, in the event of their ever purchasing their own portion of the undertaking, the amount of their share in the redeemed first cost should be credited to them. The precedent of Ossett and Horbury, of the present session, was cited in this connection.

Another matter that came up for discussion in the course of the proceedings was the effect of the period for the redemption of the loan on the price of gas. An interesting question was also put by the Chairman as to the possibility of applying a sliding-scale to a Corporation gas undertaking, for the protection of an outlying district. The Referee, Mr. Bonham Carter, said that there is such a case; but his memory must have been at fault. Possibly he was thinking of the Oldham precedent. In the end, the Committee gave Street all they asked, with the novel permission that Glastonbury might credit themselves with a profit of 1 per cent. as payment for management. The example of the London Water Companies and their debenture capital seems to have weighed with the Committee in this regard. As business men, they did not see why Glastonbury should have all the trouble and responsibility of supplying Street with gas, for nothing. It might be suggested, of course, that Glastonbury would not be doing the work for nothing, inasmuch as there would be an advantage in having such a large customer as Street. The knowledge that they are paying a small profit to their neighbour may tend to increase the desire of Street to sever the connection; but if the District Council are well advised, they will understand that severance would not tend to give them cheaper gas.

The London County Council Discomfited.

The London County Council had their delayed "innings" in the House of Commons last Thursday, when the Irish Members made handsome amends for their churlishness of the previous week, and voted as one man for the water policy of the Council. This kindness helped to break the Council's fall, and must have fully persuaded the majority at Spring Gardens that the Irish Vote ought to decide the question of the expediency of appropriating Welsh water for the imaginary needs of London half a century hence. This is obviously not the place to discuss the water policy of the London County Council, as such; but the well-merited rebuff meted out to the arrogant Progressives who wanted their own way in face of the findings of two Royal Commissions, is of more than particular significance. It is about time that somebody asked for a parliamentary return of the amount of public money spent by the London County Council in support of what the majority of this body are so fond of calling their water policy. Meanwhile, it is not a little amusing to note the scarcely articulate ravings of the "Daily News" upon the iniquity of the Government obstructing the purposes of the only sacrosanct public body in the wide world. Not a word does our daily contemporary say by way of admitting that Royal Commissions do not see eye to eye with the Progressive majority at Spring Gardens. "The second reading of the "London Water Bill was rejected in the House of "Commons yesterday afternoon by a majority of 83. If "such an insult (?) were offered to any other town in "England or Scotland, there would be serious danger of "a riot." One has heard of "bread riots," and known of popular tumults in which flags have been waved and heads broken in other causes—but not for water. But this is not the worst. The same journal bids "Londoners, please "note . . . the Tory Party, so long as they have the "power to do so, will withhold from London even 'gas and "'water home rule.'" This is the only instance that has

come under our notice of gas supply being dragged into the political question.

Well, so long as what is called the Tory Party is content to rest its action upon facts, instead of upon hollow cries and "principles," London will have no reason to complain of it. If it is to be assumed that Progressivism in municipal politics means adopting, at the public expense, a certain "programme," irrespective of the practical question of expediency, then the less London and other localities have of it the better. Oddly enough, in the "Daily News" of the 30th ult., from which we are now quoting, there are parallel columns of editorial articles. One is devoted to the adulation of the London County Council, and the other to a qualified appreciation of the London School Board. In the latter article occurs the remark: "Anything "can be proved by the use of question-begging epithets." Just so; but what is the epithet Progressive, if not of this character? Does it help anybody, or anything, to throw about "names," and impute motives to responsible Ministers of State in which the scribe himself cannot in reality believe?

This discomfiture of the London County Council is to be commemorated also for its justification of the position of other local bodies throughout the United Kingdom who have acquired their gas and water undertakings for the sake of strict expediency, and on financial bases which the London County Council have tried by every way open to them to avoid. We are told, on the high authority of Mr. John Burns, M.P., that Liverpool, Manchester, Glasgow, and Birmingham are examples of "what London "might be if the Bill were passed." As how? It is stated that "Mr. Stuart went a good deal farther than any "Provincial Council would dream of going. He accepted "the principle of the Lands Clauses Acts, which is most "unfair to the public; and he even offered that the Council "should purchase in trust for any authority to be here-"after created." Well might the impartial parliamentary reporter of Mr. Stuart's remarks punctuate his offer in this sense with the sign "(Laughter);" the truth being, of course, as everybody who has taken the trouble to read the report of Lord Llandaff's Commission knows, that only in the improbable event of Parliament sanctioning the expropriation of the Water Companies of London on far less advantageous terms than the Provincial Corporations enjoyed, could the transfer of the property be effected without throwing a very heavy additional charge upon the ratepayers.

What is the sense, moreover, of applauding Mr. Stuart's artless offer to buy the property "in trust," if the suggested establishment of a Water Board is to be scouted in the next breath as a "feeble and futile expedient"? The truth of the situation is that the small persons who have managed to get themselves into positions of unmerited influence at Spring Gardens do not understand such big affairs as the transfer of gas and water undertakings; and their flatterers in the newspaper Press are equally in the dark. Respectable newspapers, like the "Daily News," ought to be above uttering such clap-trap as that "the "spirit of reckless and unscrupulous faction which actu-"ates the President of the Local Government Board is "leading straight to a water famine of the most appalling "magnitude." This is not the way to write of a subject which has not exactly been neglected by sober-minded investigators whose conclusions have been presented to Parliament. Is the Opposition going to try and capture Office at the next dissolution with the cry of "Down with "Royal Commissions. The London County Council can "do no wrong"?

Municipal Trading.

THE House of Commons has certainly not exhibited any conspicuous power in dealing with the vexed subject of municipal trading. The question of appointing a Joint Committee of both Houses, to consider "whether a Munici-"pality should supply the mere necessaries of life—such "as highways, gas, and water—or whether they should "launch out into competition with private enterprise," was discussed last Thursday night; but the debate stood adjourned in the middle of a sensible speech of Mr. J. Samuel, who denied that any hard-and-fast line could be drawn in these matters. It is doubtful what will follow; but we have not much faith in the possibility of a good issue from the muddle in which the counsels of Parliament seem to have been plunged. It looks too much as though Parliament were to be invited to deal with the matter "on "principle," regardless of the facts. This is the wrong way about. Philosophic Radicalism may have a weakness for getting up "programmes," and then looking about to see how the facts of experience and expediency can be made to fit the immortal principles of to-day, which will be obsolete to-morrow; but this is not business. The expediency or otherwise of what is called municipal trading can never be satisfactorily settled on theoretical or general lines. It is probably wise to rivet the onus of proof of expediency upon the necks of all would-be municipal traders, and make them understand that their enterprises must be demonstrably beneficial to the public good, and not merely a way of making one section of the community pay the rates of another. This point being driven home, and the reliability of the book-keeping being ensured, it is hard to see why, for example, the Belfast Corporation should not be allowed to graze sheep on the gathering-ground of their water supply and send the stock to market. The question is essentially one of fact and of degree. Some Municipalities have made a bad name for themselves by asserting their right to a monopoly of any business in which they engage; which is absurd. This pretence on one side only provokes reprisals on the other, as when last year Parliament denied permission to "manufacture" gas-fittings to Municipal Corporations desirous of letting such accessories on hire. This is a truly nonsensical limitation. Public opinion should be left to suggest how far a Municipality might be permitted to go in trading—subject always to open competition, and adequate audit of public accounts. Monopolistic leanings and a fondness for cooked balances are the bane of British Municipal Authorities of the enterprising kind. Let them play the game fairly, and then the public interest cannot well suffer; while, conceivably, it may be advantaged.

A Change from "Fussiness."

THE London County Council are displaying a sudden and most salutary determination to look after their own proper business, which has so often had to go begging attention while the Spring Gardens busybodies have been spending their time in poking their fingers into political pies. We are far from supposing that the Progressive worthies have any intention of abandoning their megalomaniacal ambitions; but it is some consolation to the London ratepayer to observe signs of his getting a little more practical work done for his money. The Council have recently taken steps towards the prevention of that modern horror of our streets—the flashlight advertisement, which is so intensely irritating to the intelligent biped, and so frightening to the nervous quadruped. The decision to prohibit these nightly flauntings of Somebody's Soap before the eyes of the advertisement-wearied public will doubtless not be popular with our electric-lighting friends, but it will certainly be welcomed by everyone concerned for the appearance of our thoroughfares at night. A further suggested bye-law is designed to diminish the risk of injury to persons engaged in outside window-cleaning; but, as drafted, it is not very likely to prove effective. Gas companies are indirectly interested in this question, as window-cleaning is a favourite means adopted by lamplighters of supplementing their earnings at the muster, which are naturally less than those of a man employed throughout the day. Quite recently an inquest was held on a lamplighter who had met with his death through a fall from a window he was cleaning.

In further evidence of their new-born energy in dealing with matters strictly within their province, the Council last Tuesday agreed, at the instance of the General Purposes Committee, to convene a conference of other local authorities in London to consider how best to deal with some of the problems relating to the safety and comfort of the streets—matters in regard to many of which provincial, and especially some seaside, corporations, and many foreign cities, are very far in advance of our wealthy but unwieldy Metropolis. Among the questions to be discussed are those of removing house refuse, the cleansing and watering of the streets, the prevention of persons throwing litter or dangerous substances upon the foot or road ways, the clearer indication of the names of streets—for which purpose lamp-posts are most useful at night—and the efficient regulation of street cries and objectionable noises. It is also proposed to consider means for the better protection of the public from injury caused by building operations on frontage lines, and for prohibiting the use of carts with hoods which restrict the vision of the drivers.

This list constitutes a fair instalment of much-needed

reforms, which, from their apparently insignificant, or at least inglorious, character, have been too long neglected by a Council imbued with the ambition to undertake such little matters as the gas and water supply or the tramway services of London. We wish we could regard it as indicative of anything more than a temporary aberration from the policy of "fussiness" which begets proposals such as that for the adoption of testing by the portable photometer—which nobody asked for, nobody wants, and by which nobody would profit.

The Problem of Housing Town Populations.

A CONFERENCE of Poor Law Guardians was held last week in London, at which the pressing question of how to improve the housing of the poor and the labouring classes in towns was discussed. Some useful things came out in the course of the discussion, but not many. One guardian said very truly that there is a kind of solidarity in social questions; so that the prospects of one kind of improvement hang upon something quite different. It is largely this consideration that makes any real progress so difficult to originate and to help forward by specific design. One could wish that a kind of jury could be impanelled to try the actual facts respecting the housing accommodation of the people, and the means whereby it might be improved. It is of no use to leave the question in the hands of heedless or factious local authorities, or to encourage faddists and politicians to make "platforms" of it. People go into local governing bodies and join Boards of Guardians with set prejudices, which prevent their seeing straight. One man will ascribe all the evil of the overcrowding and bad housing of the people to "our pernicious land system." He sees nothing but the bogey of the "large landowner;" just as another wants to "take the capitalist in hand." Some politicians desire, above all things, to magnify their own particular clique or organization; others seek simply to advertise themselves. All this is, to the practical man, what the late Captain Marryatt called "flapdoodle," or food that fools are fed on. Some modern "Reformers" cry for it; and it is apparently found sustaining by Social Democrats and the Independent Labour Party.

There is, we believe, an uneasy feeling among the general, well-meaning, but helpless, because unguided, public that so far the treatment of this housing problem by local authorities has been bad. Speaking generally, the results have certainly not been economical, business-like, or humanitarian. At the recent conference, "Mr. Cole (Kensington) admitted it was a fact that the abolition of one slum resulted in the creation of another." Surely, there must be something radically wrong with a system of which this can be truly said. Now the local authorities are desirous of legislative sanction for going outside their own limits for the accommodation of their displaced population; and those who are dissatisfied with their accomplishment in dealing with the evil of overcrowding are doubtful as to the expediency of this fresh move. It has been roundly declared that if the municipalities had interfered less, private enterprise would have done much more, and better, towards curing the worst of the mischief on ordinary commercial principles. Again, it has been argued that municipal endeavour has been ill advised in treating the problem by "areas." It is at least plausibly contended that the work of improving and increasing accommodation can be better done if one building plot is the unit, instead of an "area." A great to-do was made in London only the other day for the glorification of the County Council over their improvement of the Boundary Street "area." It has since transpired that for 5700 persons displaced, accommodation was provided for 5500. How many of the old tenants got back to the site is not stated. Possibly not ten families. Whatever this is, it is not "rehousing."

Therefore we want a jury to inquire into the facts. It is an Age of Endowment of Research; and there is need for the institution of a good deal more, and more accurate investigation of the factors of this problem of the housing of town populations than has yet been given to it. Mr. Bond, M.P., who attended the recent conference in the capacity of an expert in the work of building companies, spoke very much to the point in stating that "the right way of dealing with the question was to endeavour to reconstitute London as it now stands. At present three-quarters of the houses of the Metropolis are of the cottage type; and thus a great deal of space is wasted. They must build larger houses in the future." This is sound, practical common sense. Vast regions of South, West, and East London are covered with "small property," which is now distinctly out of place. Some economic mean must be discovered between these shanties and the huge barracks of the County Council pattern, with floors of expensive fireproof construction and walls like a fort. Decent houses, of not more than four storeys in height, with gas and water and other necessaries laid on, might surely be provided without waiting until all the organization of society and every ordinary incentive to human effort and social enterprise shall have been "Progressed" out of existence. It is quite certain the gas and water interests would willingly co-operate with practical reformers of the businesslike type represented by Mr. Bond, in the endeavour to make London and other large cities better worth living in by those who, whatever their faults, are indispensable constituents of the work-a-day world, and must live "on the spot" where they are wanted. A philanthropic millionaire could do much worse with some of his money than commission two or three honest and capable men—one of whom at least should be an engineer, and the others destitute of "views"—to collect information upon which a 3 per cent. house-building enterprise for poor townspeople could be adventured.

WATER AND SANITARY AFFAIRS.

IT would seem that the Irish Nationalist Party were almost justified in objecting, on a recent memorable occasion, to the time of the House of Commons being taken up by a discussion on water matters, when it had been promised to them; for if the debate last Thursday on the two Bills promoted by the London County Council had taken place on the corresponding day the previous week, there certainly would have been a good deal less time for the consideration of financial questions affecting Ireland. However, the three solid hours devoted to the above-named measures can hardly be said to have been wasted, inasmuch as the outcome of all the talk was the removal of both Bills from the paper. This result was exactly what anyone who had followed the course of events in connection with the Metropolitan Water Question would naturally have expected. When the notices for the Bills were given in November, the Council did not, of course, know (though they might have guessed) what would be the nature of the recommendations of the Royal Commissioners; but when their report appeared early in the year, its language was so unequivocal as to have deterred any other body than the Progressive Party of the Council from proceeding farther with the matter. The Commissioners were strongly in favour of the undertakings of the London Water Companies being purchased by some public authority, but not by the Council; and they came to the conclusion that the Welsh scheme was both costly and unnecessary. Notwithstanding this very definite expression of opinion, and a by no means encouraging reception by the President of the Local Government Board of a deputation from the Council, the Bills were kept alive in the hope that they would be referred to a Select Committee of the House, before whom the modified views of the Council would find expression. For these views had undergone some change; and when Mr. Stuart asked support for the second reading of the Purchase Bill, he acknowledged that the Council were prepared to make concessions. He would, he said, be willing to agree to arbitration on the lines indicated by the Royal Commission; and the Council were so anxious to secure the water undertakings that they would have no objection, if allowed, to purchase them "in trust" for any authority which might afterwards be created. The House laughed at the latter proposal, which we recently ventured to characterize as "preposterous;" and Mr. Chaplin pointed out that such an arrangement would put the Council in possession of the works, and for the time being constitute them *de facto* the water authority, in direct opposition to the recommendation of the Royal Commission. The notion was a cleverly devised one; but its object was too apparent, and the House would have nothing to do with it. Mr. Whitmore moved the rejection of the Bill; and Mr. Chaplin favoured the House with an excellent speech which contained a few pertinent extracts from the Commissioners' report. The House was convinced; and the Bill was thrown out by a majority of 83.

The Purchase Bill having been disposed of, the fate of

the Welsh Supply Bill was quickly settled. Its rejection was moved by Sir F. Dixon-Hartland, the Chairman of the Thames Conservancy Board. He pointed out that there was no necessity to go to Wales, for, with a proper system of storage, the Thames and the Lea could supply all the water that was necessary. Welsh members considered the water proposed to be taken for London was needed for Wales; and therefore they objected to the Bill. Mr. Chaplin thought the whole matter might be left for settlement by the new water authority; and as the House had just decided that the County Council should certainly not be that authority, it would be out of place to entrust it to them. This was perfectly logical. Mr. Chaplin might well have emphasized the fact that the cost of the Welsh scheme, as shown by the report of the Royal Commission, would be much greater than that of a scheme of storage reservoirs in the valleys of the Thames and the Lea, to utilize to the fullest extent the waters of those rivers. However, he expressed the opinion that it is the construction of such works as these which is the present need in connection with the Metropolitan Water Supply, and said he regretted the rejection of the East London Bill last year. Sir F. Dixon-Hartland stated that, except at certain times in the autumn, an enormous quantity of water passes over Teddington Weir; and an adequate system of storage would allow of ample supplies being furnished during all the dry months without detriment to the Thames. This statement is fully borne out by the returns of the gaugings of the river for February. In that month the average daily quantity of Thames water supplied by the Companies was 108,122,000 gallons; while the minimum flow over the weir was 925,800,000 gallons, and the maximum 10,024,200,000 gallons, after the Companies had drawn their authorized amounts. Taking the above-named daily quantity of water for the month, we have a total of 3,027,416,000 gallons, which was less by 1,093,084,000 gallons than the flow over the weir on the 16th of February, when 4,120,500,000 gallons were recorded. Before going to distant sources, therefore, let us make the best use we can of those at our very doors. The Commissioners say there is enough water close at hand to last for the next forty years, allowing for the increase in the population; but it requires conserving. They acknowledge that the resources of the Thames will be more severely tried after the above-named period, and that the question of seeking water elsewhere will then assume a different degree of importance; but it will be for the water authority of that time to carry out such a scheme as will meet the requirements of the London of that day. Meanwhile a gigantic project such as that proposed by the Bill has been proved by experts to be totally unnecessary.

In view of the general feeling expressed by the House, Mr. Buxton suggested that the Bill should be withdrawn; and this course was followed. The two measures were thus disposed of for the present session. As to the probability of their revival—or at any rate one of them—it would be idle to speculate. But it is certainly time some definite action was taken to settle the Metropolitan Water Question; for the Companies and the public must be equally tired of a condition of things which involves so much unnecessary expenditure of money. Every year the County Council vote something like £12,000 in connection with water legislation; and the outlay entailed upon the Companies by Royal Commissions and parliamentary proceedings is exceedingly heavy. As this agitation has been going on for some years, the total amount spent on both sides must be simply enormous. This waste should be stopped, and the associated Water Companies, or a Water Board, allowed to carry out the scheme of storage reservoirs recommended by Lord Balfour's Commission of 1892-3. Under the provisions of the Bill promoted by the Companies this session, there was a prospect of something being done in this direction. But, unfortunately, owing to non-compliance with parliamentary practice, the Bill, which had been introduced as a private one, had to be withdrawn on Thursday, and will have to come before the House as a public measure. It is to be regretted that a temporary check should thus have been put upon the progress of this important scheme. At the same time, it is gratifying to learn that the great undertaking at Staines is still making highly satisfactory progress. Tired, apparently, of depreciating the London Water Supply on the score of quantity and quality, the County Council inspire adverse criticism of these works, which have been stamped with the approval of the highest engineering authorities in the land, and are being carried out by contractors whose experience of such constructions is unique and whose reputation is world wide. But, as "The "Times" pointed out last Saturday, the whole controversy which it has lately been sought to "galvanize into life" by correspondence in its columns has been practically settled by exhaustive inquiry. The result of that inquiry is—and London ratepayers should be very thankful for it—that the Welsh scheme has been shelved in favour of the reservoir scheme, which is actually in progress. We can now, therefore, leave the subject; and we do so with an expression of regret that the works at Staines could not be commenced in time to allow of their being utilized for the storage of a large portion of the enormous bulk of water—about 116,500 million gallons—which flowed past Teddington during the month of February.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 886.)

Business on the Stock Exchange last week ran for the most part on very special lines. By far the greater number of departments were decidedly quiet, some for money reasons and others for war reasons; but a degree of compensation for this inactivity was as usual found elsewhere, and last week the buoyancy of the American railway market was the solace for sluggishness elsewhere. A few others followed in their wake; but the gilt-edged division, with Consols at their head, were depressed. However, the fall in prices generally is not very serious. The Money Market was very firm. The end of the quarter brought its usual strong demand. The Stock Exchange settlement, too, had its requirements; and the discount rate held very stiff. Business in general was somewhat broken in upon by sport last week, as is not infrequently the case in the Boat Race week; and this no doubt largely contributed to bring about the condition of quietude which extended far enough to include the Gas Market. Here there was a decided falling off from the rate of progress promised by the course of things in the preceding week. There were not many changes in quotation; but they are nearly all in the downward direction, and some of them are fairly considerable in degree. The extraordinary advance in the prices demanded for gas coal must naturally affect the price of gas; and all over the country substantial increases in price are being announced. These advances automatically lower the authorized rates of dividend of sliding-scale companies; and therefore so long as the present pinch for coal lasts, we may expect to see lower quotations for gas stocks. This is a thing which has happened before, and will doubtless happen again as things come round; so we must bear it philosophically while it is happening now, marshalling the full years with the meagre. Among the Metropolitan Companies, Gaslight ordinary was moderately dealt in at steady figures without much fluctuation, and the secured issues also were unchanged. There were a few dealings in South Metropolitan at good level prices. Commercials were quiet and unchanged. Business in the Suburban and Provincial group was very limited; and movements were confined to Brighton original, which was pulled down by a deal at the low figure of 242½. In the Continental division, Imperial held its position, but not strongly; European was rather weak; and Union had a smart fall, with business marked 160. The only advance registered was in Cape Town, which rose ½. The Water Companies were as quiet as usual, and rather weaker; Kent and East London receding a little.

The daily operations were: Business was quiet on Monday, with pretty fair prices ruling. Quotations did not move. Tuesday did not bring much increase in activity, nor any in strength. Brighton original fell 5, and San Paulo ½. On Wednesday, the tendency was still easy; but things kept very quiet. Continental Union dropped 5, and Brighton original 3. In Water, Kent was 3 lower. Thursday was about the quietest day of the week, and nothing moved. Friday was busier, mostly in Gaslight ordinary. Movements were unimportant; Cape Town rising ½, and Tuscan falling ½. In Water, Kent recovered 2; but East London fell 3. Business was limited on Saturday; and the only move was a relapse of 5 in Continental Union.

In the Queen's Bench Division of the High Court of Justice yesterday, before Justices Ridley and Darling, the appeal by the London County Council against the decision of the Magistrate at the South-Western Police Court (Mr. E. W. Garrett), on Nov. 14 last, dismissing their summons taken out against the Wandsworth and Putney Gas Company for an alleged contravention of the London Building Act, 1894, in respect of the erection of a new purifier-house, came on for hearing, and resulted in a reversal of the order of the lower Court; but an appeal was allowed. The proceedings before the Magistrate were reported in the "Journal" for Nov. 21 last (p. 1251); and yesterday's will be given next week.

ELECTRIC LIGHTING MEMORANDA.

Subways in the City of London—Electric Railway and Tramway Returns—The Trolley System no Panacea—How the Small Provincial Towns are Treated.

ANOTHER straw has been added to the burden of the City of London Electric Lighting Company, by the provisional passing of the preamble of the City of London (Various Powers) Bill. An important part of this measure relates to the construction by the Corporation of subways for the accommodation of gas and water mains and electrical cables, which are to be compulsorily removed from the streets to the subways, on conditions to be approved by the Board of Trade. Although some of the wording of the Bill is vague, and there is a good deal in its provisions which they regard as objectionable, the Gas and Water Companies did not seriously oppose the measure; but the two Electric Lighting Companies presently and prospectively doing business in the City opposed it very strongly. The unfortunate Company above named contended that they had spent £490,000 on their distributing plant in the City; and they declared it would ruin them to be compelled to remove all their cables from the streets, and put them in subways, without any provision being made for continuing the supply during the alterations. Underground works are a sore point with the Company, since their early tussle with the Corporation over their conduits. The Charing Cross and Strand Company are not in quite so evil a case, as they have not yet done any main cable work in the City. Eventually, with an expression of opinion that the Electric Lighting Companies ought to be put upon the same footing as the Gas and Water Companies in the matter of continuance of supply during the alterations, the Committee passed the preamble. It was remarked at the same time that the Bill is one that will need to be carefully dealt with on clauses, which probably means that it may be considerably cut down before getting through the Committee stage.

Some leading results of electric railway and tramway working are published in the current number of the "Electrician," in the shape of analyses of the accounts to the end of last year of the Liverpool overhead and the South London underground lines, and the Oldham to Hyde and Blackpool to Fleetwood tramways. The Oldham undertaking had only been working for half the year; but the Blackpool tramway started at the comparatively ancient date of July, 1898. The judgment of our electrical contemporary on its own figures is that they speak for themselves, and can support only the one conclusion that "the trolley system is *par excellence* the system for tramways. It is the best remedy for the almost hopeless state of numerous existing British horse tramways, the dejected shareholders of which are most aptly symbolized by their jaded horses; and it is the only system of mechanical traction for tramways that combines in a satisfactory degree the requirements of the public, the passengers, and the capitalist, be he ratepayer or shareholder." We do not dispute the justice of this sweeping conclusion, while venturing to hint that it is rather tall for its foundation. After all, a two-legged stool is not a very stable support; and one would like some other proof before abandoning oneself to the ease of lounging on it.

This is a very busy time for promoters of electrical tramways. Some—including the London County Council—prefer to call them light railways; but the name does not matter. It may be accepted as proved by international examples that the overhead trolley-wire system of working tramways by electricity answers very well, where the tramway otherwise succeeds at all. With all respect to the superior authority in matters electrical of the "Electrician," we must enter a protest against the attempt, if such it be, to administer the system to all tramways everywhere as an infallible remedy alike for debilitude and for apoplectic conditions of the traffic. This is perilously like quackery. The trolley system can handle any amount of traffic with security and a speed which horse traction cannot approach. For the latter reason alone, where there is plenty of traffic lying in wait for improved accommodation, and where there is room for street tramways with other vehicles, the trolley system is indicated as the readiest means of improvement available. Where tramway owners are "dejected," and the line is in a hopeless condition, the question of the expediency of conversion to electrical traction is one for careful consideration—certainly not for answering off-hand. It does not appear, by the way, that there is any great competition among the controllers of electric traction interests to get possession of a vast number of these almost derelict lines throughout the country, although they might doubtless be had cheap. At the other end of the scale, where the amount of general traffic and the character of the streets do not permit of tramways at all, the overhead trolley wire and all its accessories must give place to the electrical railway, overhead or underground, as circumstances dictate. Although an electric railway is not exactly a gold mine, some of the few yet in existence pay a dividend which would perhaps be more satisfying if the claims of depreciation were better regarded.

There has been forwarded to us a pamphlet setting forth a proposed electric lighting and refuse destructor scheme for the town of Sudbury, Suffolk, which appears to have been provisionally adopted by a Committee of the Corporation. The scheme rests upon a report of Mr. W. C. C. Hawtayne, Consulting Electrical Engineer, who naturally finds that the town of Sudbury "offers a good field for electricity supply." Of how many towns has the same observation been made—and what has come of believing the flattering tale! The report goes on in the familiar way to "work out" the prospects of the demand for electricity and the means by which it could be supplied—of course, at a clear profit all along. Curious examination of the estimate, however, fails to ascertain the date of this good time to come. Mr. Hawtayne is careful only to say that he considers that "within a few years about 8000 8-candle power lamps will be connected to the mains at Sudbury; but in my report I have considered that only 6000 are connected"—what moderation! How can a cold critic cavil at such prudence? Still, the calmer-minded among the ratepayers would do well to make sure of the number of English towns which actually have about one electric lamp in use per head of the population, and whose experience bears out the Sudbury Committee's anticipation that no charge will be put upon the rates for the carrying out of Mr. Hawtayne's recommendations. "No charge!" Will the Mayor, aldermen, and town councillors who put their signature to this statement indemnify the town from any loss consequent upon the acceptance of their rash forecast? No outsider, cognisant of the nature of the business, would bet sixpence on it.

THE FUTURE OF ELECTRICAL SUPPLY.

THE Electrical Power Bills of this session, to which occasional references have been made in the "JOURNAL," stand grouped for consideration by a Select Committee, with Sir James Kitson as Chairman, early in May. They have survived the attempt of the Manchester School of Municipalizers in the House of Commons, represented by Mr. Galloway, to strangle them in their cradle, so to speak, in the avowed interest of municipal monopoly; and their ultimate fate will be decided upon their merits. It is impossible to exaggerate the importance of the idea at the back of these projects, especially to all the industrial interests for which the cheapest and most convenient supply of power that can be had is a desideratum. This idea, it may not be superfluous to state once more, is that power can be advantageously generated in large quantity in the immediate vicinity of the natural sources of energy in Nature, there converted into electricity, which can be transmitted "in bulk" to convenient centres of demand, whence it can be distributed economically in the forms required for doing useful work in existing industrial settlements. Every step in this definition requires separate examination and, if possible, proof, before the acceptability of the whole can be regarded as established. And then it must be shown that the general principle is adaptable to the areas named in the Bills, under the conditions set forth.

It has been argued in these columns, whenever the topic has been discussed, that the commercial possibility of the principle has not yet been proved for this country. The public have been confronted with Bills proposing to do for different parts of the United Kingdom something which has never been shown to be worth doing at all, there or elsewhere. The cart has been put before the horse, and is so in the present case of the grouped Bills. Let us look into the right facts of the matter, and see what conclusion may be reasonably arrived at by the soundest engineering judgment we can bring to bear on the suggestion as it stands.

So far as Parliament can do it, the way has been cleared for the realization of any meritorious electrical power "in bulk" scheme. When the generation and distribution of electricity on a commercial scale was first accorded statutory protection, it was not contemplated that any undertaking of the kind would be other than a local affair, like gas supply. It was assumed that, like gas, electricity would be generated and used on the spot. As soon, however, as it was represented to Parliament that it might be desirable to make electricity in one place for use somewhere else—involving the traversing of neutral intervening ground, as to which legal difficulties might arise—Parliament forthwith recorded the opinion that no such obstacles should be permitted to block the natural development of what might be esteemed a useful service to the community at large. This declaration of the Legislature was the charter of electrical power "in bulk" schemes. It is being relied upon with complete security, by the Metropolitan Electric Supply Company, who are laying down a huge generating station at Willesden, whence the power will be transmitted, across neutral intervening territory, to their distributing stations of Inner London. This example is one of the class of what might be styled proprietary electrical generation in bulk schemes, which are mere incidental developments of manufacturing policy common to all big supply concerns. It is not an electrical power "in bulk" scheme at all, of the order now in question.

Schemes of the kind, moreover, received further protection from Parliament, albeit informally, by the important precedent of the rejection by the Commons of the monopolistic pretensions put forward by Mr. Galloway without a division of the House. This left the way clear, as we have remarked, for the treatment of the proposed ventures on their merits, which are susceptible of being considered in the general, and in the particular. We have nothing to say about the latter; but what of the former? Has engineering judgment any grounds for accepting it as established, referring to the step-by-step definition of the subject-matter already given?

It is really remarkable how little reliable and definite information has been offered on this head. The shining lights of British electrical science have not hitherto done themselves credit in this connection. Several of these celebrities committed themselves to support of the Highland Water Power Scheme of last session, which was lost through the admission of Mr. Mansergh that the capital cost of the water-works had been much under-estimated by the promoters. It is tolerably certain, therefore, that no more will be heard of any artificial British "Niagara" power scheme. There is no available water power in this country for any such purpose. But this is not all: Reflections and aspirations based on reports of what is done by water-power electricity at Niagara, or in Switzerland, are completely beside the question as it is presented in this country. We would rather trust the Swiss examples than the American, so far as they go, and feel no hesitation in asserting that the Niagara affair is absolutely meaningless for others, even if all that one hears as to its wonderful success is true. On the other hand, it would not be difficult to pick out half-a-dozen mills in Manchester which use more power every day than all the water-power privileges of Switzerland could provide.

It has been asserted, and never controverted, that the English coal fields can supply, by the agency of Lancashire boilers, cheaper power than is procurable anywhere else. Indeed, it has been stated that Lancashire millowners actually get their power at a lower rate than the Niagara Power Company charge for power transmitted to the nearest factories. Be this as it may, it seems pretty safe to assume, without relying upon the delusive consideration of the cheapness of "waste" fuel—which has a way of becoming inconveniently dear as soon as it is utilized—that power can really be generated at the pit's mouth at least as cheaply as it could be procured by any other means known to science. The next question obviously is, whether this is worth the doing. The answer depends on the relative efficiencies of alternative means of transmitting and distributing the power, when obtained, to the places where it can be used.

What contribution towards the economical solution of the problem is made by the latest gains of electrical science? An essay on this head has been published by Mr. Alton D. Adams, in the March number of the "Engineering Magazine." This may probably be relied upon as an authoritative exposition of the newest and best electrical power engineering. Electrical engineering offers the world a system of main generating plant, with the fewest possible large, direct connected engines and dynamos, developing alternating current at high pressure. This current is carried by cables to sub-stations, conveniently located, where it is changed and adapted to all consumption requirements. Such, stripped of technicalities, is the method of working of all electricity-in-bulk schemes. Simple as it appears, it has only been arrived at through a laborious calculation of ways and means. Where electrical energy can be utilized as it is produced, there is the simple and the ideal condition of maximum efficiency. Unfortunately, if the electricity has to be made by steam power, the disturbing consideration is introduced, that steam-engines are most economical when built and operated on the largest scale. The employment of such large units of power means transmission of the energy in bulk, which again involves high voltage currents. These have to be converted and reduced before they can be used; so that the seeker after economy is presented with one of the horns of a dilemma, and has to decide between power transmission by means of electric current, and by the humble coal-bag.

When the user of electricity makes it on the spot, he can get a kilowatt of distributed energy for every kilowatt of output of the generator. When the generator is removed to a distance, several sources of intermediate loss have to be allowed for. "The simplest common arrangement of the main and sub-station system includes dynamos at the generating plant, and transformers and rotary converters at the sub-stations. A high figure for the efficiency of the rotary converters is 90 per cent., and of the transformers 95 per cent., under average conditions. These figures give a combined efficiency in operation of $90 \times 95 = 85$ per cent.; and, allowing a loss of only 5 per cent. in the lines between the main and sub-stations, there will be only $0{\cdot}85 \times 0{\cdot}95 = 0{\cdot}80$ of a kilowatt delivered to the distribution lines for each kilowatt output at the steam-driven dynamos. Taking the capacity of rotary converters as 1, that of transformers is $1 \div 0{\cdot}9 = 1{\cdot}11$, and of main dynamos $1{\cdot}11 \div (0{\cdot}95 \times 0{\cdot}95) = 1{\cdot}23$; so that the combined capacity of electrical equipment per kilowatt output is $1 + 1{\cdot}11 + 1{\cdot}23 = 3{\cdot}34$ kilowatts. The main-and-sub-station system of electrical supply . . . requires, therefore, an investment in electrical machinery of more than three times the capacity "equivalent to the useful output." This does not look particularly encouraging. Nor is it all: Such a system "demands, also, expensive transmission cables between stations, while it delivers to distribution lines only about 80 per cent. of the electrical energy developed."

The foregoing is the best that can be done for the purpose; and inasmuch as, if we interpret Mr. Adams's figures aright, at least $3\frac{1}{2}$ times the energy must be generated at the prime movers that will ever be accounted for at the consumers' terminals, electricity generation in bulk must be so much cheaper than local production, to put the two methods of working on an equality. Is this probable? Everything depends on the answer that can truly be given to the question. We shall most emphatically decline to attempt a reply. That is for the experts. Mr. Adams raises the further question of whether gas power could not be advantageously substituted for steam power in electricity generation; but here again the ground is uncertain. Curiously enough, Mr. Adams's studies, as an electrician, bring him round to the consideration of the familiar question as to whether, instead of transmitting energy by cable, it could not be better conveyed in the form of gas in pipes. As regards the technic of the two systems, there is nothing to choose. One system is as easy to apply as the other. Many factors are common to the two problems; and therefore in distinguishing between them, Mr. Adams only counts items peculiar to each method. The result is worth noting.

Mr. Adams finds that "comparing the two systems of electrical supply above described, it seems that the first cost of the complete equipment is about the same for each case; but the complete electric system is somewhat less efficient. The combined efficiency of the main dynamos, step-down transformers, transmission line, and rotary converters is $0{\cdot}90 \times 0{\cdot}95 \times 0{\cdot}95 \times 0{\cdot}90 = 0{\cdot}73$; while the combined efficiency of the gas-main and the dynamos at the sub-station is $0{\cdot}95 \times 0{\cdot}90 = 0{\cdot}85$. The system which places the gas-engines at sub-stations, while costing no more for the first investment, delivers $0{\cdot}85 \div 0{\cdot}73 = 1{\cdot}16$ times as much of their output for distribution as does the system with all the engines at a main station."

Whatever else may be the purport of this apparently detached and impartial criticism of alternative methods of power transmission, it seems to place beyond doubt the ability of gas-engine power to hold its own against distributed electrical power. At the same time, it makes decidedly heavier the burden of proof of expediency which has never yet been fairly grappled with by partisans of electrical power schemes aiming at doing a general business with all comers.

LAWYERS AND THE WORKMEN'S COMPENSATION ACT.

It would be of much interest and instruction if statistics could be compiled to show how many of the actions brought against employers by their workmen owe their inception and prosecution to the legal fraternity. Some firms of solicitors make a good thing out of taking up the cases of Trade Unionists accidentally injured in the course of their employment, and attempting to get out of the employer something more than the compensation provided by the Act of 1897. They put in a claim for a lump sum under the Employers' Liability Act, or at common law, in the hope that the employer will pay up rather than incur the cost of contesting the action—for a verdict in the employer's favour, even with costs, is often an expensive victory when the plaintiff is a labouring man. A verdict against the employer is, on the other hand, practically one for the solicitor; the costs not seldom absorbing most of the award. That actions having such origin are extremely prejudicial to the interests of the working classes is obvious; for they give rise to very natural irritation on the part of the employers towards their men, and often involve the men themselves in actual loss. An employer who would compensate without question a man who had been injured in his service, if a claim were put in by the man himself, is as likely as not to get his back-up on receiving a high-handed letter from a solicitor advancing an extravagant claim, and to fight the case right out—with perhaps the result that the man is found not to be entitled to a penny-piece under the 1897 or any other Act.

We are induced to draw attention to this objectionable practice by the report of the proceedings, before the Court of Appeal yesterday week, in the case of *Welland v. The Great Western Railway Company*. The facts were as follows: The plaintiff, a lad, met with an accident in the service of the defendants, who admitted liability, and offered to pay 7s. 6d. per week (being half the lad's wages) during the period of his incapacity. The Solicitor acting for the plaintiff declined, however, to accept this offer, and threatened proceedings unless the defendants paid his client £300 compensation and himself £20 costs. On the matter coming before the County Court Judge, Counsel on behalf of the Company having informed his Honour that they had offered and were willing to pay what was the full amount provided by the Workmen's Compensation Act, Judge Beresford refused to hear the case, which was then carried to the Court of Appeal. The higher Court decided that the plaintiff was entitled to have an award registered at the County Court, in order to give him the right to apply to that Court at any subsequent time, should he find that the injury prevented him resuming full work. They therefore remitted the case to the County Court, and allowed costs against the Company. Judge Beresford accordingly made and registered an award for the terms offered, but only granted an order for £5 to be paid to the plaintiff's Solicitor to cover the costs of the arbitration.

Application was thereupon made to the Court of Appeal, for a rule calling upon the County Court Judge and the defendants to show cause why a bill of costs for £42 put in by the plaintiff's Solicitor should not be taxed and allowed in the usual course. The Court, after some hesitation, granted the rule; and it came up for argument on the 26th ult. Lord Justice Smith found that the Court of Appeal had no jurisdiction to grant the rule, application for which should have been made to the Divisional Court. The rule was therefore discharged. His Lordship added further,

however, that, had the attention of the Court been drawn, at the time application was made for the rule, to order 33, rule 3, of the Rules of Court made under the Workmen's Compensation Act, the rule would never have been granted, as beyond doubt the County Court Judge had, under that order, discretionary power to order a fixed sum to be paid for costs under circumstances such as the present. These circumstances were that the Company never disputed their liability in full; and yet the Solicitor acting for the lad incurred expenses amounting to over £41, and was applying for an order to have this bill of costs, "so scandalously run up," taxed in the ordinary way. In discharging the rule, costs were given for the Company; and the order of the County Court Judge allowing the Solicitor only £5 was confirmed. Upon application being made for leave to appeal, leave was refused; Lord Justice Smith remarking that "he hoped the bill of costs as between solicitor and client would be very well taxed down, otherwise this unfortunate lad would not be able to pay it off for years."

Further comment from us is needless; but the attention of employers may well be drawn to the salutary provisions of order 33 of the Rules of Court. Its existence and enforcement should act as a considerable deterrent to solicitors desirous of trading upon the ignorance of the working classes.

RECENT PUBLICATIONS.

The Rights of Local Authorities as Regards Private Bills. By C. E. Allan, M.A., LL.B. (Shaw and Sons.)

The interests of gas and water undertakings touch so nearly those of Local Authorities, and the legislative proposals of one are so often opposed by the other, that it is essential for the promoters of Private Bills in Parliament to be thoroughly acquainted with the rights possessed by those who may offer their opposition thereto. The publication under notice provides, in a concise and handy form, full information as to the rights that Local Authorities possess to promote or oppose Bills in Parliament, and to use their funds for such purpose.

The Legislature has, fortunately, been somewhat chary in conferring upon public bodies the right of promoting Bills at the expense of their constituents; and when such right has been conferred, it has always been granted subject to restrictions. For many Local Authorities, the only method of procedure is by Provisional Order. With the possible but very doubtful addition of Rural District Councils, the only public bodies that have the general right of initiating Private Bill legislation at the expense of the ratepayers are the London County Council, Municipal Corporations, and Urban District Councils. The London Vestries, County, Rural, District, and Parish Councils do not possess the right. These authorities can, however, promote Bills by virtue of the general right of any individual to petition Parliament, provided that they meet the attendant expenses by means other than a charge upon the rates—such as by public or private subscription—or by inserting a clause within the Bill authorizing the payment of the expenses out of the rates. The latter course has been several times adopted, as in the case of the Uttoxeter Water Act, 1892. As to the limitations of the powers possessed by the Municipal Corporations to promote Bills, and the provisions of the Borough Funds Act, 1872, the author gives all necessary information.

The power to oppose Bills is then dealt with; and cases are quoted to illustrate the somewhat rare circumstances under which Corporations have been restrained from devoting public funds to the opposition of Private Bills. The two principal cases are those of *Regina v. Mayor, &c., of Sheffield*, relating to a Bill promoted by a Water Company supplying Sheffield, and *Attorney-General v. Swansea Corporation*, in which the Corporation were restrained from opposing a Bill which would have affected the price of gas in their district.

The final chapter deals with the subject of *locus standi*, and explains the practice of both Houses of Parliament in regard to determining questions arising as to the *locus standi* of public authorities desiring to be heard in opposition to Private Bills. Among cases cited where *locus standi* has been refused to public bodies, is that of the Chester Corporation Water Bill, 1896, against which the Rural District Councils sought to be heard, on the ground that a proposed dam would cause a period of stagnation in a river running along one side of their district, which stagnation, it was declared, would lead to silting-up and consequent flooding. The Standing Orders of the House of Commons relating to the injurious affection of a town or district by the promotion of Lighting and Water Bills are given at length, and are briefly explained.

A useful appendix contains the essential sections of the Borough Funds Act, 1872, the Public Health Act, 1875, the Municipal Corporations Act, 1882, and the Local Government Act, 1888, with some useful annotations. The book appears to have been carefully compiled.

Masonic.—Last Wednesday, Bro. Thomas Cash, of Birmingham, was installed W.M. of the Evening Star Lodge, No. 1719, in succession to Bro. Thomas E. Priestman; the Senior and Junior Wardens, subsequently invested, being Bro. W. D. Child and Bro. W. Arthur Valon, junr.

PERSONAL.

Mr. Alfred J. Kingdon, of Suffolk House, E.C., Secretary to the Colonial Gas Association, has been appointed Secretary to the Westward Ho! and District Gas Company, on the retirement of Mr. Henry de Rusett.

After thirty years' service as Manager, Mr. S. Dawes has severed his connection with the Clevedon Gas Company; and at the meeting of the shareholders last Tuesday, it was decided to allow him an annuity of £50.

Mr. R. Ashton has now retired from the post of Manager of the Barnstaple Gas Company. Last year he resigned the office of Secretary, which he had filled for more than thirty years; and the Directors will recommend the shareholders to grant him a retiring allowance.

Mr. E. J. Sutcliffe, Superintendent of the Thornton Road Gas-Works of the Bradford Corporation, has been appointed Superintendent at the Birkshall works, and Mr. W. J. Dowsu, Assistant at the Mill Street works, has been promoted to the Superintendentship at Thornton Road.

Mr. W. Spier has, for private business reasons, resigned his position as Secretary and General Manager of the Rockhampton (Queensland) Gas Company, Limited; but, appreciating his past services, and desiring to have him as a colleague in the management of the Company's affairs, the Directors have unanimously elected him to a seat on the Board.

An intimation having been given to the Gas Committee of the Oldham Corporation, by Mr. John Chadwick, the Engineer and Manager, of his desire to be relieved of a portion of his duties or allowed to relinquish his position, the Committee, at their meeting last Wednesday, appointed Mr. Edwin Platt, who is at present engaged at the Higginshaw station, Assistant-Manager, subject to the approval of the Town Council.

At a meeting of the Directors of the South Staffordshire Water-Works Company, held at their offices last Thursday, Mr. Frank James (who had at the half-yearly meeting of proprietors, on the 22nd of February last, been re-elected a Director of the Company) was unanimously re-appointed, for the twenty-seventh time, Chairman of the Board. Mr. James became a Director in 1861, and Chairman in 1874; and during that long period he has not been absent from the monthly meetings of the Board or the half-yearly meetings of proprietors excepting on one occasion, when he was engaged before a Parliamentary Committee in the interests of the Company.

[In last week's "Journal" a paragraph sent by our Edinburgh correspondent appeared stating that Mr. Frank Green, of Hamilton, had been appointed Draughtsman and Assistant-Manager of the Ceará Gas-Works. We are asked to contradict this statement, and to say that Mr. Green applied for the position of Clerk to the Company advertised in the "Journal" for Feb. 20. He has been appointed to that position, and "has no other official title in connection with the Company."]

A Correction.—Through a printer's error the output of coal per man in 1897 was given last week (p. 792) as 201 tons, instead of 291 tons.

The German Association of Gas and Water Engineers.—The fortieth annual meeting of this Association is fixed for June 9 to 13 next, at Mayence. The programme of proceedings at the gathering will be announced later.

Increase in the Price of Gas in South London.—Owing to the great advance in the cost of coal, the South Metropolitan Gas Company have given notice of an increase of 3d. per 1000 cubic feet—from 2s. 1d. to 2s. 4d.—in the price of gas.

Eastern Counties Gas Managers' Association.—The 23rd general meeting of this Association will be held on Wednesday, the 18th inst., at the Lion Hotel, Cambridge, under the presidency of Mr. Harry Wimhurst, of Sleaford. According to the programme issued by the Hon. Secretary and Treasurer (Mr. J. H. Troughton, of Newmarket), one new member will be proposed; a paper on "Incandescent Street Lighting" will be read by Mr. J. H. Sheldrake, of the Welsbach Incandescent Gaslight Company; and a discussion on "The Present Price of Gas Coal, and its Effect upon the Gas Industry," will be opened by Mr. R. G. Shadbolt, of Grantham. The business, which is of exceptional interest, will include the election of office-bearers for the ensuing twelve months; and at its close the members will dine together.

Photographs of Gas-Works for the Paris Exhibition.—In the Gas Pavilion which has been erected in the grounds of the Paris Exhibition, it is intended to have a collection of photographs of the principal gas-works in France and other countries. With the view to making it as complete as possible, the President of the Executive Committee (M. Eugène Lebon) will be glad to receive any photographs which our readers may have of their works, accompanied by a few descriptive particulars. Unmounted prints, rolled upon wood or cardboard, will be preferred; but if they are mounted on stout paper or framed they will be equally acceptable. As to size, 9½ inches by 12 inches is suggested; but the larger the better. The Committee will undertake the placing of the photographs upon the panels reserved for them in the Pavilion. M. Lebon's address is 26, Rue de Londres, Paris.

NOTES.

Zinc-White Paint.

The expert writer on paints for the "Ironmonger" recently gave some useful information respecting the nature and preparation of zinc-white paints, which are so largely used where the liability of white lead to tarnish renders this pigment unsuitable. It is remarked that pure or genuine zinc white, sometimes called Chinese white, should consist simply of the metal and oxygen. The zinc oxide has never been largely manufactured in this country; most of the supply being of foreign origin. When ground into paste, it should carry about 22 per cent. of linseed oil, or nearly three times as much oil as is taken up by white lead. There is no chemical combination between the zinc oxide and the oil, as there is in the case of white lead; it is merely a mechanical mixture, which is probably the reason why its covering power is so much less than that of genuine white lead. Besides the zinc oxide, there are also sold as pigments the sulphide of zinc, marked as lithopone, patent zinc white, &c. This sulphide is generally blended with barytes—a sample of lithopone, for example, sometimes showing as much as 60 per cent. of sulphate of barium, with only 40 per cent. of zinc oxide and zinc sulphide together. It is as well to bear in mind that barytes itself does not make a bad pigment; only it is cheaper than most of the other ingredients that go to make white paint, and should be allowed for accordingly.

Peat for Carbonizing.

It is probable that the scarcity and dearness of true coal in the eastern parts of Europe will have the effect of concentrating attention once more upon the possibilities of peat utilization. An Austrian chemist, G. Thenius, observes that the greater part of moorland peat occurring in this part of the world is suitable for distilling, after a preparatory compression in a Schlickeyson apparatus. The resulting blocks are then air and kiln dried, after which the material will yield on carbonizing 35 to 40 per cent. of good dense charcoal (superior to wood charcoal), 25 per cent. of ammoniacal liquor, 6 per cent. of tar, and 29 per cent. of gas. The last figure needs explanation. The tar furnishes on distillation 25 per cent. of crude burning oil, 20 per cent. of "solar" oil, 15 per cent. of lubricating oil, 25 per cent. of paraffin oil, and 15 per cent. of pitch. The burning oils are stated to give a good light; and the purified paraffin is also good. The resultant gas is said to be of good illuminating quality; but, as might be expected, it carries a large percentage of carbonic acid, and is tarry. Gas of this character has been profitably manufactured at Salzburg for years. Other grades of peat, not suitable for distilling, are utilized for litter, and also for making millboard. The future of gas lighting in a large area stretching from the Tyrol to the Balkans is largely dependent on the adaptability of local peat deposits to this manufacture, either directly or by way of carburetted water-gas apparatus.

Working Pumping-Engines by Producer Gas.

Motors operated by producer gas have for some time been employed to work the pumps used for the distribution of the water at Bâle. The recent addition of another pump, driven by a motor of 200-horse power, will ensure the continuity of the supply of water for some years. It was constructed at the well-known Deutz establishment, and has two cylinders, arranged tandem fashion, 22 inches in diameter with a 34-inch stroke. Its speed is 140 revolutions and 60 strokes per minute in normal work. The gas used is made from gas coke or anthracite; the former being preferred, as it is less expensive than the latter. The pumps are of the single plunger type, with pistons 12 inches in diameter and 28-inch stroke. There is also a steam-pump at the water-works; so that a comparison can be noted between the direct and indirect work of the fuel in lifting water. The pumps ran all through the year 1898, except on two Sundays, with the result that 135½ million gallons of water were distributed by the steam-pump, and 856½ millions by the gas-engine pumps. The consumption of coal by the steam-engine was 1 lb. 14 oz. for each 220 gallons of water pumped; in other words, 260 gallons were raised to a height of 286 feet per kilogramme (2·2 lbs.) of coal consumed. These figures unfortunately do not give any idea as to the cost of pumping; they simply show what duty can be obtained from motors worked with producer gas in an important installation. Coal gas would probably be quite as cheap if it were charged only at its cost into the holder.

The Standard of Steam-Engine Performance.

Dr. Robert H. Thurston, of Cornell University, has performed the useful service of registering the level at which steam-engine design and construction has been brought at the end of the century. This statement will be a useful datum from which progress in the making of prime-movers can be measured. He declares that the wastes of our best engines may be to-day taken as usually not far from 20 per cent. thermal and 10 per cent. dynamic. At the beginning of the century, there were in Watt's best engines about 60 per cent. thermal and 15 to 20 per cent. dynamic. The progress of the century in this respect has been mainly in the reduction of the internal thermal wastes; while the effort of the present is mainly to improve thermodynamic efficiency by increasing the range of temperatures worked through. This is to improve the cycle by approximating more closely to Carnot's ideal. The duty of the steam-engine has steadily risen until it marks 160 million foot-pounds per pound of pure carbon. The best return of American pumping-engines up to date is from 130 to 150 million foot-pounds; while the expenditure of dry steam per indicated horse power per hour ranges from 11·22 to 12·52, at pressures varying from 121 to 176 lbs. All these model machines are large engines, developing from 574 to 1185 indicated horse power. All have ratios of total expansion closely approaching 20, with a piston speed on the average of about 200 feet per minute. It is remarked that after a hundred years the steam-pumping engine still furnishes a record of greater extent and more representative character than does any other type of engine.

The Improvement of Lubricants.

From some expressions contained in a review by the "Ironmonger" of a book on "Lubrication and Lubricants," written by Messrs. Archbutt and Deeley, it would appear that there are some physical qualities of oils and fats which are not commonly appreciated at their full value by machinery users. The authors establish the principle that, particularly in the case of heavy, slow-running machinery, efficient lubrication does not depend wholly on the viscosity of the lubricant—as is usually taught—but rather on a quality which they call "oiliness." It is not easy to define what is meant by this word in this connection with dictionary exactitude; yet mechanics will not experience any difficulty in recognizing the quality so designated. Oiliness is that which makes a lubricant feel slippery between the fingers. Glycerine is as thick a viscid as many oils; but it is not very slippery to the touch, because it is not "oily." It might also be said that vaseline is not "oily." Oiliness of nature seems to be that property which prevents a liquid film from being squeezed or rubbed down below a certain minimum thickness, which is an important consideration in a bearing. Viscosity is the property which prevents the film from breaking or separating altogether. Mineral lubricating oils are deficient in oiliness; and accordingly it is advised that there should be added to them a proportion, not exceeding 10 or 15 per cent., of fatty oil. This is a matter that appeals especially to the users of pumps and gas-exhausters.

COMMUNICATED ARTICLE.

THE EFFICIENCY OF STEAM AND GAS ENGINES.

By Ed. C. de Segundo, Assoc.M.Inst.C.E.

It has long been recognized that the thermal efficiency of the gas-engine is much greater than that of the steam-engine; and not a few eminent men have predicted a great future for gas-engines on this account—believing, as they did, that the necessary inventive faculty would sooner or later be forthcoming to devise the means of overcoming mechanical and other difficulties lying in the way of the development of the gas-engine as a large motor. For many years the gas-engine has occupied a safe position as an economical and convenient means of developing power on a small scale; but until recently no great inducements were held out to manufacturers to build gas-engines of large power—one of the chief causes being that, beyond a comparatively low limit, the cost of power produced by town gas is greater than that of steam power.

Taking gas at 3s. per 1000, and 20 cubic feet per indicated horse power as a fair average consumption of town gas in engines of good make indicating 8-horse power and upwards, a limit is reached at about 20 indicated horse power above which the combination of steam-engine and boiler is more economical. The cost of gas would be $20 \times 20 \times \frac{36}{1000} = 14{\cdot}4$d.; and the cost of coal, assuming 3½ lbs. of coal per indicated horse power per hour, in a non-condensing engine giving 20-horse power, and taking the price of coal in towns at 20s. per ton, would be 7·5d. But the interest on the capital outlay, together with depreciation and maintenance costs connected with the boiler, and the proportion of extra wages for a boiler attendant, cannot be put at less than 7d. per hour, which would bring the cost up to that by gas-engine power. In cases where the town gas is richer or poorer in calorific value than the average, or where steam power already exists, or coal can be obtained very cheap, the limit of economical generation of power from town gas would be proportionately raised or lowered; but most manufacturers of gas-engines admit that, after about 14 nominal horse power (corresponding to about 20 to 25 indicated horse power), it is more expensive to use a gas-engine than a steam-engine under average conditions and the average price of town gas.

There can be no doubt that the introduction of producer gas in the place of ordinary town's gas for motive power in gas-engines, gave an enormous stimulus to the design of gas-engines for large powers; and in this connection Mr. Emerson Dowson's name is perhaps better known than any other—"Dowson" gas having passed into a household word. By means of Mr. Dowson's gas-producing plant and a gas-engine of any good type, a complete power-generating plant can be erected almost anywhere, provided it is within reasonable reach of coke or anthracite; and the attainable consumption of fuel per indicated horse-power-hour developed by gas-engines of 50-horse power and upwards using Dowson gas, may safely be taken at about

1 lb. of anthracite or 1¼ lbs. of coke. Such a result has so far not been attained by any steam-engine.

Gas-engines developing 100-horse power have for some years figured in Messrs. Crossley's catalogue. In 1895, a 320 indicated horse power gas-engine of the "Simplex" type was working mill machinery at the Pantin mills, in France—gas being generated in a Lencauchez producer. The mean consumption of rough coal during a trial extending over 194 hours was stated to have been 0·81 lb. per indicated horse power; and the calorific value of the producer gas was about 150 British thermal units per cubic foot. In 1896, Professor Meyer published an interesting account of the results of a test made of a 160-horse power gas-engine at Bâle, which was driven by Dowson generator gas; the consumption of gas coke being 1·4 lbs. per indicated horse power per hour. The thermal value of this generator gas was 133·28 British thermal units per cubic foot. A gas-engine of 158-horse power at Birmingham, is driven by producer gas from a Lencauchez generator; the gas having a calorific value of 185 British thermal units per cubic foot, and the fuel used being coal costing less than 3s. per ton at the pits. At Wishaw, near Glasgow, the waste gases from four blast-furnaces are utilized in driving an "Otto" gas-engine for electric lighting, the consumption being 77 cubic feet per indicated horse-power-hour; while at the Société Cockerill's works, at Seraing, Belgium, the results of the utilization of waste gases for driving gas-engines have been so satisfactory that a "Simplex" engine of 500-horse power is being constructed for the purpose. The natural gas found in many parts of the United States has also been successfully used for driving gas-engines; the consumption being 10·5 to 12 cubic feet of natural gas per indicated horse-power-hour, and the natural gas having a calorific value of about 1000 British thermal units per cubic foot.

The Westinghouse Machine Company completed a 650-horse power gas-engine early in 1898; and it is now erected and working in the central generating station of the Westinghouse Electric and Manufacturing Company. It has three cylinders, each working on a crank. It is coupled direct to a dynamo, and runs in conjunction with one or two steam units, in supplying power for electric supply. This engine will shortly be eclipsed by a 1500-horse power engine of the three-cylinder type, which the Westinghouse Machine Company are hoping shortly to bring out, and which is expected to give 1 indicated horse-power-hour with a consumption of 8½ cubic feet of natural gas. Such a result would correspond to less than 1 lb. of fuel burnt in a good producer plant per indicated horse-power-hour.

From the above examples, it will be seen that the gas-engine is about to enter upon an entirely new phase of its existence. Its use is no longer limited to small powers; and it bids fair to enter into competition with the steam-engine for a very large number of purposes for which hitherto the steam-engine has been held to be the only suitable prime mover. There can be no doubt that 1 indicated horse-power-hour can be developed by a gas-engine of large power driven by producer gas, with a lower expenditure of fuel than has been attained in a steam-engine—no matter how large, or what the design. The efficiency of the process of conversion of the heat energy of the fuel into mechanical energy must, therefore, be greater in the gas-engine than in the steam-engine combination—that is to say, starting with 1 lb. of fuel in the producer and 1 lb. in the furnace of the boiler, less waste must take place in converting the fuel into producer gas and the gas into mechanical energy, than occurs in generating steam by the heat of combustion of fuel and converting the energy of the steam into mechanical energy.

In the case both of the gas-engine and steam-engine we are concerned with three efficiencies—namely, the efficiency of the gas or steam generator, the heat efficiency of the engine, and the mechanical efficiency of the engine. With regard to the latter, the mechanical efficiency, or ratio of brake horse power to indicated horse power, is about the same in gas as in steam engines of average design for the same powers. The thermal efficiency of the gas-engine, or ratio of heat turned into work to heat due to perfect combustion of gas entering the cylinder, is certainly higher than that of the steam-engine.

The following figures are taken from a trial by Dr. A. B. W. Kennedy of an 8-horse power nominal Griffin engine, indicating 18·62-horse power at full load. The gas had a calorific value of 677 thermal units per cubic foot; and the quantity used per indicated horse power per hour, as calculated from the working stroke, was 18·92 cubic feet, corresponding to an expenditure of $18{\cdot}92 \times 677 = 12{,}808$ thermal units. The heat turned into work per explosion, calculated from the working stroke, was the equivalent of 4132 foot-pounds; and the mechanical equivalent of the total heat due to the perfect combustion of the gas consumed per explosion was 20,620 foot-pounds. The engine therefore turned into work $\frac{4130}{20{,}620}$, or practically 20 per cent., of the heat it received.

Let us now compare these figures with the results that one might fairly assume could be obtained with a steam engine and boiler of equal horse power. A steam-engine of this size would probably be a high-pressure non-condensing engine, consuming about 3½ lbs. of good coal (of a calorific value of, say, 14,500 thermal units per pound) per indicated horse power per hour. Assuming a boiler efficiency of 75 per cent., $3{\cdot}5 \times 14{,}500 \times 75$ per cent., or about 38,200 thermal units, would be supplied to the cylinder per horse power indicated per hour. Now, the thermal value of a horse-power-hour is $\frac{33{,}000 \times 60}{772} = 2565$ thermal units. Hence this steam-engine would only turn into work $\frac{2565}{38{,}200}$, or about 6·7 per cent., of the heat supplied.

The superior thermal efficiency of the gas-engine is due to the greater range of temperature through which the cycle of operations is carried on. In the gas-engine trial above alluded to, the calculated temperature at the commencement of the fall of pressure was 2155° Fahr., or 2615° absolute; and the assumed temperature of the gas and air leaving the cylinder was 570° absolute. The maximum efficiency, or the greatest amount of heat that the gas-engine could in these circumstances turn into work, would be $\frac{2615 - 570}{2615}$, or 78·2 per cent. or $20{,}620 \times \frac{78{\cdot}2}{100} = 16{,}124$ foot-pounds.

Therefore this gas-engine turned into work $\frac{4130}{16{,}120}$, or over 25 per cent., of the heat which it was theoretically possible for it to turn into work. Applying the same reasoning to the case of the steam-engine above quoted, the temperatures between which the cycle would work would be about 821° Fahr. absolute (corresponding to an initial pressure of 140 lbs. per square inch) and 660° absolute (corresponding to a back-pressure of 2 lbs. per square inch). The maximum theoretical efficiency would be $\frac{821 - 680}{821} = 17{\cdot}2$ per cent.; and the comparative efficiency of the steam-engine in question would be $\frac{6{\cdot}7}{17{\cdot}2}$, or about 38 per cent.

The steam-engine, therefore, is considerably more efficient than the gas-engine when considered from the standpoint of their respective limitations. In other words, were it possible for this 16-horse power engine to work through so great a range of temperature as the gas-engine, it would turn more than one-and-a-half times as much heat into work as the gas-engine. This would correspond to 1 horse-power-hour with a consumption of about ½ lb. of coal.

The best steam-engine performance yet recorded is that of a quadruple expansion pumping-engine working at Pittsburg. It indicates 662-horse power, and consumes a little over 1 lb. of coal per indicated horse power per hour. This very interesting result has been attained by the practical development of Professor Cotterill's suggestion as to the part utilization of the heat supplied to the engine in heating the feed water. In this instance, the feed is delivered to the boiler at about 31° Fahr. The duty of the engine, or the work done per 1,000,000 thermal units supplied to it, is about 10 per cent. greater than that recorded of any similar engine. The steam consumption was 12·26 lbs., and the pressure 200 lbs. per square inch, corresponding to a temperature of 387° Fahr.; and the lower temperature limit was about 140°. The Carnot efficiency, therefore, would be $\frac{848 - 601}{848} = 29{\cdot}1$ per cent. The heat supplied was 11,157 thermal units per horse-power-hour. Hence the maximum amount that the engine could theoretically turn into work would be $11{,}157 \times \frac{29{\cdot}1}{100}$, or 3246·6 thermal units. The thermal equivalent of 1 horse-power-hour is 2565 thermal units; and so the comparative efficiency of the engine was $\frac{2565}{3246} = 79$ per cent., which is greatly in excess of anything yet recorded in gas-engine practice.

The figures and results above quoted have been obtained from trials made under conditions which probably would not obtain in everyday practice. Moreover, one would naturally expect a better result from a steam pumping-engine than from a steam-engine supplying power for a load which varied from hour to hour, perhaps from minute to minute. For variable loads, even the staunchest advocates of gas-engines have hitherto hesitated before recommending their use, and the steam-engine has been considered to occupy an unassailable position as a power producer—for instance, in electric current generating stations. The results recently achieved by the Westinghouse Company would, however, appear to open out quite a new sphere of usefulness for the gas-engine. In their three-cylinder type, an impulse is given every two-thirds of a revolution; and the method of governing, by restricting both the gas and air supply, also aids very materially in keeping the speed constant under large variations of load.

The greatest obstacle in the way of the progress of the gas-engine as a large power producer was its unsteadiness of speed. The "Otto" gas-engine, in which one impulse is given every two revolutions, and which governs by a hit-and-miss arrangement, is, of course, hopeless where uniformity of speed under varying loads is a condition *sine quâ non*. Various attempts were made to overcome this defect, and many cycles other than the "Otto" were tried; but it is significant that, when the patent controlling the "Otto" cycle expired, nearly all makers of gas-engines immediately reverted to it. It was, however, not the cycle that was at fault; it was the system of governing, which rendered the attainment of anything like a uniform speed quite impossible under rapid variations of load. From what the author has been told by eye-witnesses of the performance of the Westinghouse 650-horse power engine, it would appear that very material progress has been made towards rendering the gas-engine, when worked by producer gas, a real competitor with steam.

TECHNICAL RECORD.

THE CARBONIZATION OF COAL FOR THE PRODUCTION OF ILLUMINATING GAS.

Mr. W. R. Herring on Inclined Retorts.

At the Meeting of the Royal Scottish Society of Arts, in Edinburgh, on Monday last, Mr. W. R. Herring read the following paper on the above-named subject.

The carbonization of coal for the production of illuminating gas may be said to be an important industry in all civilized communities; and without speculating upon the influence that improvements in artificial illumination have had upon the progress of mankind, it may be permissible to say that in Great Britain alone £96,209,668 of capital is employed in supplying one of such illuminants—namely, coal gas. This capital brings about an annual turnover of £36,946,738. During the past ten years, the consumption of coal employed in the production of illuminating gas has increased from 9,663,011 tons in 1889 to 12,841,817 tons in 1899. It may be fairly stated that this increase has taken place during the period of the commercial utilization of electricity as a means of domestic illumination. The cause of the constantly increasing demand for coal gas, in face of so much competition, is not easily explained—particularly when we bear in mind the fact that those who were formerly the largest consumers of gas are now consumers of electricity instead. Notwithstanding this fact, however, the average consumption of gas per consumer over Great Britain has only decreased from 40,218 cubic feet in 1889 to 39,196 cubic feet in 1899; and during the same period, the number of consumers has increased by 45 per cent.

The continued increase in the consumption of gas is no doubt in some measure accounted for by the introduction of gas cooking and heating appliances. But this in no way accounts for the bulk; and in the author's opinion, the increased consumption is chiefly due to the habits of the public demanding a greater degree of illumination, both in private and business premises, than was formerly customary. The introduction of the electric arc lamps for the lighting of the main streets in our cities and towns, has brought about an entire change in the degree of illumination demanded by the public. Brightly illuminated streets demand brightly illuminated shops; and the two combined necessitate better illumination in our homes. This is clearly illustrated in the case of our own gas supply. Notwithstanding the introduction of the electric light just five years ago (and bearing in mind the fact that the bulk of those who were formerly the largest gas consumers have now practically severed their connection with the gas supply), the gas consumption per consumer has increased in the period under consideration from an average of 18,522 cubic feet in 1889 to an average of 21,948 cubic feet in 1899.

The introduction of the Welsbach incandescent gas-light, if it has not already done so, will in the near future bring about almost a revolution in the conditions of gas supply. It is quite possible that very soon an incandescent burner and mantle will be procurable for the sum of 1s. complete, and renewal mantles at about 3d. each. When such is the case, this system of illumination will become universal; and the necessity of supplying an illuminating gas will cease to exist. The production of an illuminating gas of high quality is primarily responsible for the present selling price of gas in all towns. A non-illuminating gas is as efficient, when used in conjunction with the Welsbach burners and mantles, as an illuminating agent; and there is no doubt that when the time comes for the suppliers of gas to meet the altered conditions, it will be possible to do so at a cost of from one-third to one-half less than the present supply, as it will permit of many varying classes of coal being used in the production of gas which at the present time are shut out in consequence of it being necessary to select only such coal as will yield, not only a satisfactory quantity, but gas of a quality equal to the public demands.

The threatened competition of the electric light may be said to have awakened the gas industry from a long period of lethargy, coupled with which, and about the same period, the labour problem was becoming a very troublesome one with the gas undertakings throughout the country. Up to this period, there were but few works—in fact, scarcely any—where the advantages of labour-saving appliances were properly appreciated. It may be said that all these millions of tons of coal previously mentioned were handled by the most primitive methods. Competition and high-priced labour, however, put new life into the gas industry, and compelled boards of directors and gas committees to listen to the suggestions of their responsible officials, and to vote the necessary funds for the introduction of labour-saving appliances and machinery for dispensing with manual labour.

The labour costs for manipulating the total weight of coal used in gas manufacture during the year 1899, basing it upon the average of the principal gas undertakings in the country, was exactly 3s. per ton, or a total cost of £1,926,272. It will therefore be seen that any economy that can be brought about in the cost of manipulating the coal, will represent a very substanttal saving to the gas-consuming public. The gas industry offers a very wide field indeed for the application of mechanical appliances for this purpose; and many brains are at work at the present time in devising new schemes, and revising the application of old methods, to this end.

Notwithstanding the fact of the introduction of machinery for the charging of horizontal coal-gas retorts into some of the largest works in the country, it has not had any appreciable effect upon the manufacturing costs of gas-works. Under the very best conditions, machinery has proved to be only capable of saving (after allowing for the excessive wear and tear of such) but a few pence per ton of coal. The cost during the year 1889 amounted to 2s. 11d. per ton, and, as already stated, in 1899 to 3s. per ton. During this period, machinery for charging horizontal retorts has been largely introduced into the principal gas-works; and the slight saving it effected has been entirely absorbed in the advance of workmen's wages in the period under review. Other methods have, therefore, had to be sought, in order to reduce the physical exertion in the carbonization of coal; and the one the author particularly wishes to draw attention to this evening is the application of the force of gravity to the charging of coal-gas retorts.

The physical properties of all solid bodies in a disintegrated state, whether in the form of powder or in a granular state, or in an irregular lumpy condition, to assume a natural angle of repose when thrown or tipped into a heap, is well known to us all; and the particular angle which various bodies assume is spoken of as its "angle of repose." It cannot be claimed that the application of this known tendency of solid bodies to assume an angle on an inclined plane, at which it will lie in repose for any length of time, is in any way novel as applied to the charging of materials into retorts or other receptacles. It appears to have been first applied to the feeding of retorts for the carbonization of coal in the year 1851, under a patent granted to one Alfred Vincent Newton. Another patent was granted in the year 1854 to a French engineer—Aristide Balthazard Berard, of Paris—who claimed to "distil the coal in a cylindrical conical fire-clay retort having its axis inclined to the horizontal to an angle of not less than 40° nor more than 60°." A further patent was granted to Robert Griffiths, in 1863. The primary object of this invention was the extraction of coal oil; the retort being "built or fixed at such an angle and elevation that, when small coals are placed upon the upper end of the retort, they will slide down the sloping bottom thereof by their own gravity."

In 1864 a patent was granted to Stephen Kerry for the calcining of bones, and for reburning and revivifying animal charcoal. In this, the inventor claimed "for the laying and setting of the retort in an inclined direction at such an angle as will allow the contents to run down the retorts by their own gravity, or by the force of supply at the upper end, the angle preferred being 32½°." Similar patents were also granted in 1872, 1873, and 1878; but it was not until 1889 that any practical installation appears to have been taken seriously by the gas engineering profession. Fate, however, was more kindly disposed to the inventor who revised the system and obtained a patent for the same in 1885—André Coze, Director of the Gas Company at Rheims. A small installation was erected at the Rheims Gas-Works, which was in successful operation for some time, and so much impressed British gas engineers who had the opportunity of inspecting it that arrangements were made by the Engineer of the Brentford Gas Company (Mr. Frank Morris) to put down a small installation at his works. This took place about the end of 1889.

In the year 1890, a large installation was also erected at one of the London works on Coze's model; but experience proved that on a large scale the system, as then existing, was not applicable to British practice. Not only were the physical difficulties experienced insurmountable, in consequence of the impossibility of keeping a tight joint between the iron shoot of the fire-clay retort buried within the red-hot brickwork, and also in consequence of the coal choking upon the bend, but the conditions under which the men charging the retorts had to work—exposed as they were to the heat, flame, and smoke from the open mouthpieces at the top—were such that no workman could be honestly put to perform the operation. The Engineer of the Brentford Gas-Works, anticipating these difficulties after experience with his own experimental installation, set to work to revise the system, and adapt the principle to the English practice; and by his labours, a very considerable advance was made in rendering the invention a practical success. Indeed, to all outward appearances, the modifications introduced by Mr. Frank Morris stand good to-day, notwithstanding the fact that many important details and simplifications of construction have been introduced by other engineers who were engaged in pioneering the system in its early introduction into the country.

At a period when labour troubles were very pronounced in the gas industry, gas administrators lent a more willing ear to any method which promised to relieve them of the increasing cost for labour, and more particularly the difficulties of dealing with it when paid at the higher rate; and it is no doubt primarily due to this fact, and also to the threatened competition of the electric light, that gas engineers were induced to really take the innovation seriously. In 1891, the author was instructed by the Huddersfield Corporation to carry out an entire reconstruction and extension of their gas-works, to carbonize 400 tons of coal per day. He naturally looked seriously into the question of the application of inclined retorts, as against the then best-known methods of setting horizontal retorts and charging them by power-driven machinery. The result of these investigations led

him to advise the Huddersfield Corporation to carry out their extensions solely on the principle of what is commonly termed the inclined retort system.

At the outset, a plant was designed for carbonizing 180 tons of coal per day, to be constructed within a then existing building. A further development of the reconstruction scheme necessitated another extension of the carbonizing plant within twelve months from the former plant being put to work. It had, however, worked in such a satisfactory manner that further extensions were carried out on exactly similar lines, with improvements in details which experience had shown to be necessary. This plant was constructed within a new building designed for the purpose; and by supporting the roof upon a circular girder construction, the plant can be conveniently erected without the side-walls being carried unusually high—the upper parts of the structure of the plant being practically above the side-walls of the building. The plant in question was designed for carbonizing 220 tons of coal per day. Since it was put to work in 1894, the whole of the coal gas manufactured in Huddersfield has been produced from inclined retorts.

Prior to the introduction of the newer system, the wages for this purpose cost 3s. 4·19d. per ton manipulated; whereas during 1899 exactly similar costs were only 1s. 9d. per ton. Brentford, as far as the author knows, is the only other works of any considerable size where the whole of the gas has been produced from inclined retorts for some years past; and upon reference to reliable statistics, he found that prior to the introduction of inclined retorts the Brentford carbonizing wages were 3s. 5·35d. per ton of coal, whereas for the last completed financial year they were 1s. 11·8d. There is thus in the case of Huddersfield a saving of 1s. 7·19d. per ton of coal, and in that of Brentford 1s. 5·55d. From these figures, it will be seen that by this method of coal-gas manufacture, as compared with the best-known systems hitherto in existence, it will be quite safe to estimate on a saving of, say, 1s. 6d. per ton of coal, which sum, upon the total coal carbonized per annum, amounts to nearly a million of money.

This figure cannot be altogether accepted as the economy brought about, unless it can be shown that the cost of construction of the newer plant is no greater than in the case of the plant it is intended to supersede. Upon this point, however, it is very difficult to arrive at comparative figures. So far as the author's experience goes, when taking into account the fact that greater producing power can be obtained from a given area of land, and that a retort-house properly constructed is less in cubical capacity for a given unit of production, the cost for inclined retorts is not greater than for a similar installation of horizontal retorts equipped with power-driven drawing and charging machinery.

At the present time, the system is in operation in many towns on a more or less large scale of working—including among others Brentford, Burnley, Coventry, Edinburgh, Hartlepool, Leeds, London, Middlesbrough, Salford, &c.

A small installation of inclined retorts was constructed at the Edinburgh Gas-Works early in 1899, and was put under fire in July of the same year. The object of erecting a small installation in the old works at Edinburgh, was to permit of careful investigations being made into the physical characteristics of Scottish coals when worked on the basis of gravity charging—the system not having been previously worked in Scotland. The plant erected is an identical unit of the multiple that is to form the carbonizing plant at the new gas-works now in course of construction at Granton. The setting was put to work in the early autumn, under ordinary practical conditions; and up to the present time every conceivable class of coal has been passed through it, with the result that valuable information has been accumulated as to the physical characteristics of the various classes of coal when charged and carbonized in inclined retorts, from which it is evident that the principle requires special modification for dealing with the different classes of coal such as are to be obtained in Scotland. The modifications, however, are mostly of a minor character, but yet of sufficient importance in themselves to make or mar success. The designs for the larger works to be erected at Granton are now in process of completion, in the light of the experience gained at the Edinburgh works; and it is anticipated that the new plant will be completed in about eighteen months' time.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Annual Meeting in Boston.

The Thirtieth Annual Meeting of this Association was held at Boston on Feb. 21 and 22—Mr. Walter R. Addicks, of Boston, the President, in the chair.

The President delivered an Inaugural Address, in which he characterized the past year as a period of great commercial activity, which had exercised due influence in increasing sales of gas. But satisfaction with this state of things was somewhat modified by the increasing price of all materials and supplies, even the railway companies having increased their rates. This meant, for those working under close management at any rate, either reduced dividends or a rise in the price of gas; for no present or prospective increase in business would compensate for the advance in cost of materials now being experienced. Within a week, he had read that the enormous shipments to England would increase the cost of Pittsburgh coal 2s. per ton. In alluding to the New England Gas and Coke Company and the Massachusetts Pipe-Line Gas Company, he considered the circumstances of an undertaking worked on a primary coke-producing basis—the gas being regarded as a residual. The requirements of the coke trade were not so inexorable as those of gas. One could put up a notice "No coke for sale to-day;" but the gas consumer must be supplied, and the maximum demand periods for gas and coke respectively would not always coincide. The gas producer might come in to meet the difficulty; producer gas being used to heat the coke ovens whenever there was a full demand for all the coal gas. He next asked his hearers to imagine a huge works, comprising long rows of 1500 to 3000 horse power gas-engines connected to alternating current dynamo machines, triple expansion vertical steam-engines of 3000-horse power each, also connected to alternating dynamos, a long line of mechanically stoked boilers, then water-gas plant, inclined retort stacks, and coke-ovens. Appropriate condensing, purifying, and storage plant would also be required. Any surplus of producer gas, poor coke-oven gas, or coal gas could be used by the gas-engines, and thus made the means of assisting the supply of electricity. The boilers could be fired with surplus coke or gas, admitting of the retorts and generators being kept in full work independently of variations in the demand for gas. Such a set of plant would be capable of meeting very wide variations in the demand for coke and gas, and could be arranged to meet all sorts of requirements. Attention was then directed to the efficiency of the gas-engine as an agent for producing electricity. Some experiments conducted with a 10-horse power engine, with gas at 4s. 2d. per 1000 cubic feet, showed that, with a full load, the cost of electricity per unit was only 1½d., and with a variable load, less than 3d. Referring to the Gas Commission reports of past years, it would be observed that the average consumption per consumer tended to decrease. At present, it was not 80 per cent. of the amount recorded in 1892 and 1893. On further inquiry, this was accounted for by the large number of meters that registered less than 1000 or 2000 cubic feet per month. He gave one instance where 22 per cent. of the meters registered less than 1000 cubic feet during December and 61 per cent. measured less than 1000 cubic feet in July. In the face of these facts, it was fair to ask if the introduction of the prepayment meter would not only increase the sales, but also increase the average sales per meter. Referring specially to two of the papers on the programme, the President mentioned that in each case four speakers had been arranged to commence the discussion.

The reading of the paper by Mr. F. H. Shelton, which was reproduced in the "Journal" for the 13th ult. (p. 676), was followed by a long discussion. Mr. Nettleton agreed that it was a great step in advance to make a 3-inch pipe do the work of a 12-inch one; but he would be interested in knowing the result after a few years' working, especially after extremely cold weather and exposure to frost. He was rather alarmed, perhaps unnecessarily so, at the prospect of a fractured main under 20 lbs. pressure, as there certainly would be a very large loss of gas, if no actual damage. He would like to ask what coating was put on the wrought-iron pipe, and if the author had considered the use of cement for this purpose. They were all familiar with the cement-lined water pipe that was popular in New England many years ago. He had seen sections of the pipe in perfect condition after 25 years' use. Mr. Fowler said the results of some calculations he had made showed that the ordinary rules used by gas engineers with regard to pressure were correct for high pressures also. Mr. C. J. R. Humphreys asked if, in the case of consumers supplied direct from high-pressure mains, the author had considered the possibility of the service governor getting out of order and throwing the entire pressure on the house piping and fixtures, and if he had been able to provide for such a contingency. Mr. M'Kay asked whether any trouble arose in connection with reducing the high to ordinary pressure, also for details of the drip-boxes used on the high-pressure mains. Mr. Nute remarked that for some months he had been working lines of ordinary cast-iron pipe under 24-inches pressure for the supply of outlying gas-holders, and with satisfactory results. Mr. Prichard thought high-pressure mains might be all right in country districts, but would like to know if it was safe or advisable to lay them in the principal streets of a city. Mr. Ramsdell said that in the early days of natural gas, no particular attention was paid to pressure on the mains; but most communities supplied by this system had since adopted ordinances limiting the pressure. A very general rule was 5 lbs. There was a difficulty in using the ordinary mantle under such pressures; and the Welsbach Company made a special natural-gas mantle to meet the difficulty. It did not, however, secure such good results as the ordinary mantle, and eventually the use of governor burners became general. Most of the natural gas companies had found it desirable, for their own sakes, to adopt efficient governor systems.

Mr. Shelton replied to the discussion, and also to several direct questions. He would not care to put ordinary cast-iron mains under many pounds pressure, but preferred screwed wrought-iron pipe, properly protected from corrosion. As to the question of frost, raised by Mr. Nettleton, he did not attach much importance to it because he knew of some 2-inch pipe that had been in use under high pressures for ten years. Gas men in general did not appreciate the importance—perhaps because it had never been brought to their notice—of the work which Mr. Edgerton had been doing in

this direction at Danbury. As to the risks of house governors, that had all been worked out by the natural gas companies many years ago. The natural-gas districts were full of appliances for handling, measuring, and controlling high-pressure gas. Pittsburgh was full of governors that would, with an inlet pressure of 15 to 20 lbs. per square inch, deliver a steady 17-10ths at the outlet; and there was no more trouble with them than with an ordinary tap. They were all fitted with a safety arrangement that, in case of failure, opened an outlet delivering outside the house. If these things could be used with safety with natural gas, why should they not be equally applicable to artificial gas. For jointing pipes, he used a special socket more tapered than the usual make, that brought the pipe ends butt to butt, and when screwed home was more likely to be sound than the ordinary arrangement. There was no trouble due to condensation; and the deposit caused by the compression was collected mostly round the pump, and did not extend more than a few hundred feet along the pipe. He found no trouble from refrigeration at the governors. The best reply to Mr. Prichard was that the natural gas companies distributed gas under higher pressures than he proposed throughout all parts of crowded cities. The whole thing came down to the simple question, Why cannot we do with artificial gas exactly what has been done, with safety and satisfaction for quite a number of years, with natural gas? Of course, the apparatus should be in duplicate, to admit of cleaning or repair; but fortunately pumps and governors were comparatively cheap. It must also be remembered that the high-pressure main represented half-an-hour to one hour's storage; so that the compressors could, in case of any emergency, be stopped for some minutes without any trouble in the district.

In a paper entitled "Then, Now, and Later," Mr. John A. Waters, of Stamford (Conn.), traced some of the important improvements effected in the past, and considered them in connection with the possibilities of the future. The cost of water gas had been reduced not only by improvements in apparatus, but also in methods of working. The early practice was to occupy 20 to 45 minutes in blowing up, and even a longer time was devoted to gas making, and a high temperature in the superheater was thought to be a great advantage. A bright orange tint at that part of the apparatus was considered to indicate the proper conditions for a run. The troubles due to the formation of lamp black and pitch were considered to be unavoidable. Then a lower temperature and increased surface was thought to be preferable; and this led to the introduction of the double superheater setting. Another object in view in introducing this arrangement, was to be able to substitute crude oil for refined naphtha as the enricher. It turned out a real improvement—enabling the period of blowing and also that of running to be shortened. The practice of high-pressure blowing, with a gradually increasing heat from carburettor to superheater outlet, was almost reversed, and had given place to moderate pressures. The only ruffle on the otherwise smooth surface of water-gas manufacture was the price of oil, which had lead to the suggestion that the use of water gas should be curtailed and a mixed product supplied, or that a coal-gas plant should be provided as an alternative. In considering this subject, they must remember that to work with advantage the production must be near to the actual capacity of the apparatus used. They would call to mind the circumstances which led to the substitution of water gas for the then universal coal gas. Coke sheds and tar-wells were full; and there was no reason to suppose that coke and tar would sell any better now than they did then. He believed that while the limit of economical production and working had already been reached in the case of coal gas, there was a considerable margin for improvement in regard to water gas.

Mr. Louis J. Hirt, the Chief Engineer of the New England Gas and Coke Company, and of the Massachusetts Pipe-Line Company, read a paper on "Oven and Retort-House Construction and Results." He remarked that operations had already been commenced, and the whole plant would be working by March 1. The Otto coke-oven differed very little from an ordinary through coal-gas retort heated by gaseous fuel, but it took a charge of 6 tons or so. Once the coal was in the ovens the operation was practically the same; and the only difference was that it made a heavier or denser coke. He explained the lightness of ordinary gas coke by saying that it was exposed to heat in thin layers in comparatively small retorts, with the result that it was attacked on all sides and the hydrocarbons rapidly expelled. While the penetration of heat was similar, in the vertical Otto oven the action on the large mass of coal was much slower, and the coal was almost entirely carbonized from the two vertical sides. The heat crept slowly inch by inch through the coal, fluxing the coal in front of it; and as long as there was fresh coal in front the coke was heavy, but just for an inch or so in the middle the coke resembled gas coke. There was a greater amount of carbon left in the coke, and a lesser yield of rich gas than in the ordinary retort. The Otto oven was under some disadvantage, by reason of the thicker walls, which were about 1 inch thicker than an ordinary retort; but this was compensated for by the less expense in handling the material. An oven could be charged and discharged all within ten minutes. The coke was pushed out in four minutes, the doors closed in one minute, the fresh coal introduced at the top side in two minutes, and levelled in three minutes. Most of this could be done by mechanical means; and the saving of labour per ton of coal handled was one of the greatest and most important advantages of the system. The charge remained in the oven for 26 to 28 hours. The ovens were not gas-tight at first; but the porousness of the walls was gradually being stopped by deposits of carbon, and when the ovens were gas-tight there was no reason why the gas should not be equal in quality to ordinary coal gas. He was at present distributing 18-candle gas, obtained by taking the production during the first ten hours of the charge, and the remainder was required to supply the heat to the ovens. It was necessary to vary the time according to the temperature of the ovens, and also to that of the outside air, the effect of which was somewhat marked on such a large stack. They were arranging a producer plant to make producer gas from coke breeze, as a means of supplementing the production from the ovens, and leaving a larger quantity of illuminating gas available. If the whole of the gas was saved for sale, the average illuminating power would be about 12 candles, and an enriching plant would be required. The coke was the principal product; and the tar, ammonia, and surplus gas were the residuals. The coke was selling well. They had a long term contract for tar; and the sulphate plant, which was among the best of its kind, turned out a high quality article that was in large demand. There was no difficulty in keeping the gas well within the Massachusetts legal requirements as regarded purity. They were now pushing 250 ovens per day, consuming 1500 tons of slack coal, and making 1000 tons of coke, 67 tons of tar, 16 tons of sulphate, and 4½ million cubic feet of 19-candle gas. The consumption of lime was 16 tons per day.

Mr. Hirt replied to various questions. He said the smallest sized installation of coke-ovens that could be worked with a proper regard to economy would be a batch of twenty. The rate of production was very steady, but he thought it increased a little towards the end of the charge. In order to get 18-candle gas, he reckoned it would be necessary to take about one-third of the total production.

Mr. F. Mayer, of Baltimore, at the invitation of the President, stated his impressions formed by a four months' trip to Europe, for the purpose of investigating the inclined-retort system. He was building a new plant for a gas company who at present took their supply in bulk from a neighbouring company, to come into operation on July 1, and had decided to depend entirely on the inclined retort; and if the price of oil remained at its present level, or increased, this system was a step in the right direction for the future production of gas. To produce 700,000 cubic feet of coal gas per day, either twelve benches of sixes or eight benches of nines, with full-depth regenerator furnaces, would be necessary; or five benches of nine inclined retorts on the Coze system would do the work. He found the entire cost of a retort-house furnished with twelve beds of sixes complete would be about £11,000, or 11d. per 1000 cubic feet. The cost of working, including 6 per cent. interest on outlay, would be 5d. per 1000 cubic feet. With eight benches of nines, the cost would be 4½d., or with charging and discharging machinery 3¼d. per 1000 cubic feet. With the inclined retorts, he calculated the cost would not greatly exceed 2⅛d. per 1000 cubic feet. He exhibited a sketch plan of an inclined-retort system, worked entirely by machinery.

Mr. Ramsdell said he had studied both the horizontal and the inclined systems, and was not quite clear as to which to advise in a general way. There was a place for each; and his choice would depend upon location. He had recently decided against the inclined system because it took longer in construction than the other, and he was very short of time. From inquiries specially made, he found that, using the latest improvements in each case, the saving effected by the inclined system on the cost of operating was a mere trifle, if anything. It was misleading to figure out a cost per mouthpiece, as the cost per 1000 cubic feet of gas made was the real consideration; and no doubt more gas would be made on a given floor area with inclined retorts than with horizontals.

The next item was a discussion on experiences with prepayment meters. Mr. M'Gregor had 1336 of these in use, passing over 10 million cubic feet of gas per annum, and bringing in about £3000. He had replaced 34 ordinary meters with prepayments, and found that the result was to reduce the consumption from an average of 1663 cubic feet per month to 1181 cubic feet—a reduction of 29 per cent. This showed that the prepayment meter made the customers more careful; but without it, he would not have retained them at all. Mr. Nettleton had over 800 in use, and the income was about £2500 per annum. Many of these customers would not use gas at all without the prepayment meter. Mr. Woodward had about 300 prepayment meters in use, and the average consumption was 13,100 cubic feet per annum. Ordinary meters used by the same class of consumers averaged 16,800 cubic feet. But he was reaching a class of business that could not be got at in any other way; and there were absolutely no complaints with the prepayment meters. The Secretary said they had often remarked upon the want of intelligence and wastefulness of the average consumer; and it appeared that the prepayment meter was an educator in the use of gas. As such it would in the end prove beneficial, though at present in certain cases there was reduced consumption.

(*To be continued.*)

DR. BUEB'S METHOD OF PREVENTING FREEZING IN GAS-SERVICES.

In 1896, we called attention to a method devised by Dr. J. Bueb, of Dessau, for the prevention of the freezing up of gas service-pipes in cold weather.* This freezing is distinct from stoppages due to deposition of naphthalene, and includes the separation, not only of water, but also of benzene from the gas. Dr. Bueb's process was designed to prevent both the freezing of the condensed water and the solidification of the condensed benzene. Essentially, it consists in the addition to the gas, as it leaves the works, of vaporized spirit (alcohol). In cases where this addition is made, if water and benzene are condensed from the gas by cold, the alcohol vapour separates out also, and depresses the freezing-point of the condensed liquid to such an extent that neither the water nor the benzene freezes at any temperature to which the pipes are likely to be subjected. They remain in the liquid state, and flow into the large mains, and thence to the nearest syphon. In practice, a small evaporator heated by steam or gas is used to vaporize the spirit as it flows from an elevated reservoir in a fine stream controlled by a regulating-valve. The hot vapour of the spirit is led into the trunk main, the gas in which absorbs it without being affected appreciably either in illuminating or heating value. On the average, only 220 to 300 grains of spirit are required per 100 cubic feet of gas. Owing to the absence of much frosty weather in the winter of 1898-99, the process was first put to really practical tests during the past winter. Some particulars of trials made at various Continental works are given in a recent number of the "Journal für Gasbeleuchtung;" and from these we extract the following information.

Of the works of the German Continental Gas Company, only Potsdam had the process in operation from the commencement of the frosty weather. The results there were completely satisfactory, notwithstanding the large area covered by the distributing system. At the other works of the Company, the process was only set in action after the services to the street-lamps had become choked by a coating of ice. The coating, once formed, is not dissolved by the evaporation of spirit into the gas distributed, but only disappears when milder weather supervenes, or when the services are warmed or spirit is poured down them. The process aims at preventing freezing in the services, and must therefore be put in operation before ice has formed—that is to say, before the temperature out of doors falls below 28° or 27° Fahr. When the process is started for the first time each winter, a considerably larger quantity of spirit must be vaporized on the first day than is required on subsequent days. The drops of water clinging to the inner walls of the services eagerly absorb the spirit, and must in the first place be saturated with vapour of spirit from the gas. At the beginning of a period of frost, the evaporation of spirit must therefore be continued uninterruptedly for 24 hours, so that at least half a pint of spirit is added to every 1000 cubic feet of gas.

At some gas-works, the evaporator was not, during extreme cold, equal to the task of vaporizing the spirit completely. The evaporator ought, therefore, to have its working capacity ascertained by preliminary trial. The necessary test may be simply made by inserting in the pipe which conveys the vapour of the spirit to the main a plug of the same diameter as the pipe. This plug is removed for a few seconds when the apparatus is in full work; and thus it may be seen whether the spirit is completely vaporized, or whether liquid spirit is sprayed out along with the vapour. In one case, it was found that the pipe connecting the evaporator with the main was too narrow, and caused a great loss of pressure in the vapour of spirit passing through it. The connecting tube should not be of smaller diameter than the tube in which the spirit is vaporized in the apparatus. The apparatus must be tested from time to time for soundness; as if steam passes in and mixes with the vapour of the spirit, it completely neutralizes the action of the spirit. It is also essential that the proper amount of spirit should be vaporized. No loss of illuminating power then occurs, as exhaustive photometrical testings in the laboratory of the German Continental Gas Company have conclusively proved. When great cold supervenes, loss of illuminating power is inevitable, as the chief illuminant—benzene—then freezes out of the gas along with water. This freezing of the benzene, however, occurs whether or no spirit has been added to the gas. But when spirit is added, the benzene is thrown down in the innocuous liquid form; whereas in the absence of spirit, the benzene solidifies. It should be stated that only spirit of high strength ought to be used—such as that containing 95 to 96 per cent. of real spirit.

The good effects of the process were made evident at all the works of the German Continental Gas Company, as soon as the period of hard frost was succeeded by milder weather. With a rapid change of weather after frost, there formerly occurred bad blockages, owing to the solid deposit in the street-lamp services, thawing, and then freezing afresh in those parts of the mains which were still buried in the frozen earth. Inquiry has shown that the doubts expressed at some works as to the utility of the process can be traced to an improper and inappropriate application of it.

From other works, information has also been received with regard to the efficiency of the system. Herr C. Brodmärkel, Manager of the municipal gas-works at Hof, in Bavaria, states that he has found it answer well during the two last periods of frosty weather. The first extended from the 7th to the 28th of December, 1899; and the minimum temperature was −2° Fahr. The second was from the 7th to the 17th of January this year, when a temperature of −5½° Fahr. was recorded. After the proper proportion of spirit required had been ascertained by gradually increasing it, choking up of the public-lamp services was found only in single instances, and then only after wet meters. This result was the more remarkable as a number of ½ and ¾ inch services directly exposed to the action of the frost have been retained for both public lamps and private supplies. The consumption per 24 hours averaged, during the heaviest weeks of the year, 290,000 cubic feet; and at this time the lowest temperatures were experienced. For two or three hours before the time of maximum consumption every evening, about 350 grains of spirit per 100 cubic feet were added to the gas; but at other periods the proportion was only from 130 to 220 grains of spirit. By this addition, blockages of the services were almost completely avoided. One fault found with the process was that, where the gas had passed through many exposed mains and services, it had suffered a considerable diminution in illuminating value, owing to separation of benzene. This entailed increased expenditure on enriching material; but the efficacy of the system was so marked that the cost of both spirit and enrichment was unhesitatingly met.

Herr A. Geyer, of the municipal gas-works at Gmünd, in Swabia, is able to recommend the process from the results of his own experience. Of 290 street-lamps, only two or three were found each day during the severe weather to be obstructed by freezing. Whenever the thermometer fell to the freezing-point, the apparatus was started. The rate of consumption of 90 per cent. spirit when the apparatus was working, was about 0·07 pint per 1000 cubic feet of gas. The cost of this amount of spirit was 0·15d.

Herre H. B. Sörensen, Manager of the gas-works at Drammen, in Norway, is gratified with the working of the system. In the month from Dec. 7, 1899, to Jan. 8, 1900, he applied spirit to the extent of nearly 0·2 pint per 1000 cubic feet of gas; altering the amount used according to the cold experienced. The lowest daily temperature varied from 23° to −6° Fahr. The vapour of the spirit was introduced into the main from the evaporator by means of a T-piece, of which one end of the cross-arm was connected with the tube of the evaporator, and the other end was closed by a plug. This cross-arm was 1½ inches in diameter. The limb of the T-piece was ½ inch, and was threaded externally so that it screwed direct into a hole tapped in the main.

Herr W. Fortmann, of the Oldenburg Gas-Works, reports that the process has worked satisfactorily with him since December last. He found it necessary, however, to apply the spirit in good time and in sufficient quantity. He has had to replace by a larger one the narrow pipe connecting the evaporator with the main. Where, after the introduction of the process, the lamps were found to give but small flames, naphthalene deposits were responsible. Herr Landscheck, of Glatz, in Silesia, used the process during the winter, and found that only lamps on dead-ends of mains were ever frozen up while it was in use. Herr Happach, of the gas-works of Ratibor, in Silesia, also reports well of the system. He points out that the vapour of the spirit must enter the main at a point after the works governor. Herr J. Isler, Manager of the Winterthur Gas-Works, has had the apparatus since the autumn of 1896. During the four succeeding winters, he experienced no trouble from the freezing of street-lamps, wet meters, or services, so long as the spirit evaporator was properly applied. But when attempts were made to reduce the quantity of spirit below the proper allowance, and to delay applying the process until the temperature fell to 23° Fahr., the lamps at the extremities of the distributing system gave trouble. The process has also been used with good results for the removal of naphthalene obstructions. Herr Isler recommends his colleagues to adopt it, notwithstanding that he found the expenditure on spirit rather heavy.

Herr J. Kraisy, Manager of the municipal gas-works at Regensburg (Ratisbon), in Bavaria, reports that he has found the process satisfactory, though at times he was unable to apply it to the whole of the gas distributed. He observed that the gas to which the spirit had been added acquired a distinctive odour, which was due to the agents employed for denaturing or methylating the spirit applied. Herr Hoffmann, Manager of the gas-works at Kaiserslautern, in Bavaria, reports that not a single street-lamp was frozen (even when the temperature fell to −2° Fahr.) so long as he applied the proper quantity of spirit. Unfortunately, his supplies of spirit were deficient during one period of cold weather this winter. From the gas-works at Löbau, it is reported that only isolated instances of frozen lamp-services were found after the introduction of the system; and these could be traced to delay in putting the evaporator into operation. The greatest degree of cold was −15° Fahr.

Herr H. Madsen, Manager of the gas-works at Flensburg, in Prussia, reports that sudden cold set in on the night of Dec. 11, 1899; the temperature falling to 12° Fahr. The evaporator was not started till the following day. Consequently several of the street-lamps were frozen up before the process came into operation; but after these had been thawed, only isolated cases were reported of stoppage of supply to street-lamps, and some of

*See "JOURNAL," Vol. LXVII., p. 461.

these were traced to naphthalene deposits. In a subsequent period of frosty weather, when the spirit was applied in good time, freezing was practically avoided. The syphons on the distributing system should be charged with spirit at the commencement of the cold weather. Herr Dellmann, of the municipal gas-works at Duisburg, in Prussia, states that the spirit evaporator did not completely prevent freezing of the street-lamp services in December. The quantity of spirit applied was, however, limited, because experience of the system the preceding winter favoured the supposition that the spirit provoked the sticking fast of dry meters and gas-taps. This winter valves on the works were found to turn stiffly when the process was in operation; but no other ill effects were observed.

With regard to the proportion of spirit which should be applied, it may be pointed out that the tables given in 1896 by Dr. Bueb prescribe an addition at the rate of 0·36 pint of 95 per cent. denatured spirit per hour to every 1000 cubic feet of gas sent out per hour, when the temperature is not lower than 14° Fahr. For temperatures between 14° and −4° Fahr., the quantity of spirit should be increased to 0·45 pint per 1000 cubic feet of gas. In some of the above reports, from various works, these proportions are referred to as the proper quantity of spirit to be used.

THE DISTRIBUTION OF GAS OF DIFFERENT QUALITIES.

In the "American Gaslight Journal" for the 19th ult., Mr. E. H. Yorke, of Portland, Maine, has an article on "The Equity and Expediency of Distributing Different Qualities of Gas throughout the Twenty-four Hours." It is short, and therefore we do not attempt to summarize it. Mr. Yorke says: The distribution of a uniform quality of gas throughout the 24 hours is the common practice among gas companies. It has been continued, from the beginning of the distribution of an enriched gas to the present time, without apparently any question as to the wisdom of it, for reasons which largely appear to be because "it has always been done that way." But that there exist some considerations for a change in the practice will be evident when an inquiry is instituted into the factors involved. These will be found to be: First, the fact that in each 24 hours there are two periods—*i.e.*, a period of darkness and one of daylight—averaging throughout the year about equal lengths, in which the requirements for the use of gas are generally speaking of a totally different character; secondly, the item of leakage. If gas companies were free from that unavoidable, continuous, and costly tax upon their resources known as unaccounted-for gas, the distribution of a uniform quality of gas throughout the 24 hours would be unobjectionable. If all the hours of the 24 were hours of darkness, a uniform quality would be an absolute necessity. But inasmuch as one-half of all the time in each year is daylight, and during this period the requirements for artificial light are but slight, and could be satisfactorily served with an uncarburetted (coal) gas, the question of the distribution of such a gas during daylight, in view of the saving in cost of enrichment which would follow, then becomes a most important one. The practical waste of all the enrichment, when enriched gas is distributed during the daylight, through leaks in mains and services, the present high price of enriching oil, and the constant demand for a lower priced gas, would serve to furnish an emphatic affirmative, especially during the summer months. Beyond this, in a broad sense, the interests of the gas company and the consumer being mutual, it follows that any economy attained by the gas company must in the end conserve equally to the advantage of the consumer. That this uncarburetted gas would have a lower heating value is conceded; but the difference to the average individual consumer would be inappreciable, while the saving to the gas company would be of material amount. The practical results and economy which follow the adoption of this plan I will omit, as the saving which may be effected in the different works would vary with the different conditions. That there are two classes of companies—*i e*, the small company with but one holder, and the large with widely-scattered holders which must be filled during the hours of daylight—which could not adopt this plan without difficulty, goes without saying.

DETERMINING THE COMBUSTIBLE MATTER IN COKE AND ANTHRACITE COAL.

A recent number of the "Journal of the American Chemical Society" contained the following article on the above subject by Messrs. R. K. Meade and J. C. Attix.

Some years ago a discussion arose between the consumer and the manufacturer of a coke as to its value. The user objected to the high ash, and in support of his claim gave the analysis of his chemist, in which the ash was reported at 18 per cent. The maker replied that the analysis was worthless, as the chemist who made the analysis was probably incompetent, since he had reported nearly 3 per cent. of volatile combustible matter; and that in a 72-hour coke the volatile combustible matter could not be nearly so high. The question was referred to a well-known analytical chemist. His analysis, while agreeing with that of the consumer's chemists in the percentage of ash, gave the volatile combustible matter as 0·6 per cent. The consumer's chemists then checked their work, and still found over 3 per cent. of volatile combustible matter. They used the method of heating a 1-gramme sample for 3½ minutes over a bunsen burner, and then for the same length of time over a blast-lamp; reporting the loss, after deducting the percentage of moisture (found in another sample) as volatile combustible matter. A letter to the referee brought out the fact that he used a 10-gramme sample, and heated for the same length of time. The only excuse the consumer's chemists could give their employers was that they used the method published in Blair's standard work on the analysis of furnace materials and products, and that this was the method usually published in works on metallurgical analysis.

Of the commonly published methods for the determination of volatile combustible matter in coke and anthracite coal, none reach anywhere near even approximation. The method of Heinrichs, which, by the way, he recommends for soft coal, and says nothing about coke or anthracite, gives far from true results; nor is the method even comparative. Heating first over a bunsen burner and then over a blast-lamp, drives off volatile matter and traces of moisture, and burns some carbon. The loss occasioned by the latter in many cases amounts to several times that by the two former occurrences. This burning may be prevented by heating the sample in a non-oxidizing atmosphere, such as nitrogen. The loss after such a heating will represent the volatile products driven off by a high temperature. What these products are, it is not our purpose to discuss. Probably, even when the sample has been thoroughly dried, moisture is among them.

The determination of volatile combustible matter in coke is worth doing well, or not worth doing at all. If the determination of volatile combustible matter is used for checking the coking of the coal, it is an important determination of itself; and so long as the determination of the fixed carbon depends upon a knowledge of the volatile combustible matter, it is a necessary one indirectly, for, if the volatile combustible matter is 1 or 2 per cent. above what it should be, by just so much will the fixed carbon fall short of the true percentage.

The following investigation, looking toward a more satisfactory method of determining volatile combustible matter in coke and anthracite, was undertaken by the writers over two years ago, and was the outcome of the incident mentioned in the opening paragraph of this article. The first step was to heat samples of coke in nitrogen, determine the loss, and call such loss "volatile combustible matter" after subtracting the moisture, driven off by one hour's heating at 110° C. The method of procedure consisted in weighing samples of from 3 to 4 grammes of coke into a small platinum dish, placing this in the crucible of the carbon apparatus described by Dr. Porter W. Shimer, and passing a slow current of nitrogen through the apparatus until the air had been driven out. The nitrogen used was prepared by heating together saturated solutions of potassium nitrite and ammonium chloride. The gas was kept in glass gasholders, and freed from oxygen by passing through cuprous chloride dissolved in hydrochloric acid. The gas was dried just before use by passing through calcium chloride tubes, placed in front of the crucible. The exit-tube from the crucible dipped into strong sulphuric acid, preventing any moisture or air from getting back into the crucible. After passing through the crucible for half-an-hour, the current of nitrogen was slackened, a low flame placed under the crucible, the water-cooling apparatus started, and the heat carefully raised. After heating the coke for a few minutes over the full bunsen flame, the blast-lamp was made to replace the latter, and a high temperature maintained for 10 or 15 minutes. The sample was cooled in the current of nitrogen, removed, and weighed. Below are a few results upon a sample of coke which had been dried for one hour at a temperature of 110° C.: After heating 3 grammes over a blast-lamp for 15 minutes, the loss was found to be 0·31 per cent. After again heating, an additional loss of 0·0003 gramme, or 0·01 per cent., occurred. After heating 3 grammes for 10 minutes over a blast-lamp, the loss was 0·009 gramme, or 0·3 per cent. After again heating, an increase of 0·0001 gramme, or 00·3 per cent., occurred. After heating 3 grammes over a blast-lamp for 6 minutes, the loss was 0·0095 gramme, or 0·32 per cent. On again heating, the sample lost 0·0002 gramme, or 0·007 per cent. Heating in hydrogen was also tried, and gave practically the same result. The losses from four determinations were 0·31, 0·31, 0·29, and 0·3 per cent.

At the time these investigations were undertaken, we supposed the idea of heating in nitrogen was original with us. A letter from Mr. W. H. Brauvelt, of the Semet-Solvay Company, of Syracuse (N.Y.), however, informed us that the method essentially as worked out by us was used in his laboratory, and also in various technical and commercial laboratories in England and in Germany. Hydrogen, answering apparently as well as nitrogen, replaced the latter in most of these laboratories.

Samples of coke and anthracite were carefully standardized by heating in nitrogen, and the volatile combustible matter then determined by various methods in general use. The method commonly published of heating 1 gramme for 3½ minutes over a bunsen burner, and then for the same length of time over a blast-lamp, was first investigated. A sample of Pocahontas (West Virginia) coke, losing, on heating in nitrogen, 0·61, 0·62, and 0·6 per cent., was used in the experiments. We noted the

following points. Different operators get widely varying results, as these determinations will show—

Operator.	Percentage of Volatile Combustible Matter.	True Percentage of Volatile Combustible Matter.
A	3·01	0·61
B	2·51	0·61
C	2·36	0·61
D	2·25	0·61

This variation is due to the size of the crucible, the tightness of the joint between the crucible and its lid, the height at which the crucible is placed above the flame, and the size of both bunsen burner and blast-lamp flames. A large crucible will give a higher result than a small one, because the larger the crucible the more air will be present, and consequently the more coke will be burned and the greater the loss will be on ignition. The following are some results on this :—

Size of the Crucible.	Percentage of Volatile Combustible Matter.	Size of the Crucible.	Percentage of Volatile Combustible Matter.
12 c.c.	1·96	21 c.c.	2·56
12 ,,	1·90	21 ,,	2·58
16 ,,	2·10	30 ,,	3·19
16 ,,	2·21	30 ,,	3·42

Since the burning takes place only on the surface of the sample, the shape of the crucible would also affect the result. In a narrow crucible, the loss due to burning of the carbon would be less than in a wide one. In all of the above experiments, crucibles of the usual forms were used. Of course, the fit of the lid makes a great difference. Dr. Porter W. Shimer, in order to effect a close joint between the crucible and the lid, uses a thin piece of wet asbestos paper. This lessens considerably the quantity of carbon burned.

Ignition over different burners or blast-lamps gives varying results. A large flame, other things being equal, will burn more carbon than a small one. A few results will show the variation one may expect :—

Burner No.	Blast No.	Loss on Ignition. Per Cent.	Burner No.	Blast No.	Loss on Ignition. Per Cent.
1	1	2·12	1	2	2·91
1	1	2·20	1	2	2·80
2	1	2·31	2	2	3·00
2	1	2·39	2	2	3·11

The results by this method are not even comparative, because some cokes burn more readily than others. A soft coke burns more readily than a hard one. A sample of Connellsville coke containing 0·65 per cent. of volatile combustible matter, as determined by heating in nitrogen, gave 2·31 per cent. by heating in a covered crucible. Another sample of this coke gave 0·21 per cent. of volatile combustible matter on heating in nitrogen, and 2·66 per cent. on heating in the same covered crucible, over the same burner and blast-lamp, and under as nearly like conditions as it was possible to obtain. In this instance, a coke containing only one-third as much volatile combustible matter as another gave by this method 0·35 per cent. more.

The fineness to which the sample is reduced and the percentage of ash in the coke also probably affect the result. As the size of the sample increases, a proportionately smaller loss is incurred by burning. There is a limit, however, to which the size may be carried, for, as the sample increases, the time required to heat the mass of coke to the proper temperature increases also, and a point is reached when the 7-minute heating fails to drive off all the volatile combustible matter. Below is a table showing the effect of the size of the sample on the result.

Loss on Heating for Seven Minutes a Dried Sample of the Weight Indicated in a Covered Crucible.

Sample. No.	Loss on Heating Dried Sample in Nitrogen.	1 Grm.	3 Grm.	5 Grm.	10 Grm.	15 Grm.
1.—Pocahontas coke	1·24	3·01	2·10	1·61	1·21	0·96
2.—New River coke	0·32	1·69	0·93	0·69	0·55	0·47
3.—Connellsville coke	0·37	1·49	1·03	0·81	0·52	0·42
4.—Bye-product coke	0·54	1·61	1·08	0·87	0·60	0·41
5.—Pocahontas coke.	0·28	1·52	0·90	0·69	0·40	0·38
6.—Piedmont (W. Va.)	0·31	2·87	2·00	1·31	0·96	0·54
7.—Anthracite coal	2·85	5·10	4·19	3·01	1·87	1·03

The use of a large sample in some cases apparently attains the same end as heating in nitrogen; but even here the result is chance. A change of burners or crucible will affect a large sample less than a small one; but still quite enough to change the loss considerably. In No. 3, the use of a large sample in the determination shown in the table gives nearly the same result as is obtained by heating in nitrogen. But on taking a sample from the crucible and reheating it in nitrogen, an additional loss of 0·17 per cent., or nearly one-half of the total volatile matter, was experienced. In other words, of the 0·42 per cent. of volatile combustible matter found by heating a 15-gramme sample first for 3½ minutes over a bunsen burner and then for the same length of time over a blast-lamp, 0·2 per cent. was due to volatile matter expelled, and 0·22 per cent. to carbon burned.

The Committee on Coal Analysis of the American Chemical Society recommend heating the sample of coal over a bunsen burner for 7 minutes. For soft coals, this heating may be sufficient; but for anthracite or coke, the blast must be used in order to drive off all the volatile combustible matter. The Committee, of course, did not recommend their method for coke analysis, or at least failed to say so, in their preliminary report.

A sample of coke containing 0·61 per cent. of volatile combustible matter was heated for 7 minutes over a bunsen burner, then cooled, and weighed. The loss was 0·78 per cent. On heating in nitrogen, an additional loss of 0·48 per cent. was experienced. The heating over a bunsen burner in this case was only sufficient to drive off 0·13 per cent. of volatile matter. A sample of anthracite containing 2·85 per cent. of volatile combustible matter was heated in a similar way; and the loss was 2·26 per cent. On heating in nitrogen, an additional loss of 1·02 per cent. was experienced. The heating over a bunsen burner in this case drove off 1·83 per cent. of volatile matter.

It is to be regretted that the larger portion of the work involved by this investigation had been completed before the preliminary report of the Committee on Coal Analysis was published; consequently the authors were not able to apply this method upon as many samples as they would have liked.

If, after heating a sample of coke or anthracite over a blast-lamp and burner for (say) 7 minutes, and weighing, we again heat over the same burners and for a similar length of time, the second heating will give us an approximation of the amount of carbon burned in the first. If the loss, therefore, from the second heating is deducted from that of the first, the difference will agree fairly closely with the loss obtained by heating in nitrogen or hydrogen. The results, theoretically, should fall a little below those obtained by the latter method, since the volatile matter which is present in the first heating only displaces some of the air, and consequently there will be more oxygen present in the crucible during the first heating than during the second, and more carbon will be burned. To offset this, there will be slightly less carbon in the crucible upon the second heating; and the coke will be protected somewhat by a slight film of ash formed by the burning during the first. When the sample is small, this does not seem to introduce any considerable error; and the results are as apt to be higher as they are to be lower than those obtained by heating in nitrogen. Care must be taken to have the conditions of the second heating similar to those of the first. The same burner and blast-lamp must be used; the position of the crucible in the flame and the size of the flames themselves must be alike for each heating. The timing of the heats must be done with the second hand of the watch or clock; and the flames must be protected from air-currents and draughts. To show how closely those blanks agree, and the range of accuracy of the methods, some results follow.

Percentage Loss with 3-Gramme Samples Heated for 3½ Minutes over a Burner, and then for 3½ Minutes over a Blast-Lamp.

Sample. No.	1st Heat.	2nd Heat.	3rd Heat.	4th Heat.
1	2·01	0·86	0·84	0·88
2	0·93	0·65	0·61	0·62
3	0·94	0·51	0·56	0·50
5	0·90	0·62	0·67	0·66
6	1·03	0·67	0·66	0·72
7	3·47	0·85	0·89	0·83

By subtracting the second loss from the first, we have the results in the first column below :—

Sample. No.	By Subtracting the Second Loss from the First.	By Heating in Nitrogen, per Cent. Loss.
1	1·15	1·24
2	0·28	0·32
3	0·43	0·37
5	0·28	0·28
6	0·36	0·31
7	2·62	2·85

This is the only simple method we have tried which gives results approaching anywhere near those obtained by heating in nitrogen and hydrogen. The use of asbestos paper to make a close joint between the crucible and its lid is to be recommended where this method is used. The writers have tried placing a weighed sample of coke in a crucible, and covering it with a weighed amount of freshly-ignited sand. While the blank from burning does not run quite so high, it does not seem to be any more constant; and the results do not appear to justify the extra weighing. It is possible that, in a coke laboratory analyzing a fairly even product, a constant blank might be found and deduced, saving the extra heating and weighing.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

At the February Meeting of this Association, the members visited the Stockport Corporation gas and electricity works. On their arrival, they were met by Mr. S. Meunier, the Engineer and Manager, who, with his Assistant and Chemist, conducted them through all the various departments. Mr. Meunier explained the alterations he had made in the retort-house, as well as the other extensions he had carried out, including the introduction of water-gas plant, &c. The party were also taken through the electricity generating station, where, as at the gas-works, everything was clearly explained to the entire satisfaction of the members. A vote of thanks was accorded to Mr. Meunier for his kindness. Mr. Meunier, in reply, said they were the only Association who had visited the works; and it had given him very great pleasure to receive them. In the evening, Mr. F. West read a paper on "Revivification." He commenced by briefly explaining that a gas manager has, under penalty, to supply gas absolutely free from sulphuretted hydrogen, and that

in most cases it must only contain very minute quantities of the other sulphur compounds, and then proceeded to deal at considerable length with the different methods adopted for the removal of these compounds, the purifying materials used, and the action which goes on in the purifiers. He also explained the Yeadon revolving purifier, which was described and illustrated in the "JOURNAL" for July 19, 1898 (p. 152). A good deal of discussion ensued. The members expressed their approval of the paper, and passed a vote of thanks to Mr. West for it. Some other business was then transacted, chiefly with reference to the rules of the Association. The March meeting was held last Saturday, when the members had a "question-box" evening; it being thought desirable, as it was so near the time for the examinations in "Gas Manufacture," to have a night devoted to different matters relating to these examinations. This proved to be what was wanted, as a good number of questions were brought forward. "Difficulties met with in main-laying" was the subject introduced for discussion by Messrs. Haynes and Mottram; and "Slot meters and outdoor work," by Mr. Berry. The next meeting will be held on the 28th inst., when Mr. L. E. Halliwell, of Littleborough, will read a paper on "Answering the Questions of Examination Papers."

PAINTING BY COMPRESSED AIR.

To whatever industry we turn, whether structural or manufacturing, we see the displacement of hand labour by machine work incessantly going on; and this nothing can stop if superior results and economy can be proved—these being potential forces which will eventually overcome any little obstructive action that those directly interested may evince at the outset. Painting by mechanical means is one direction in which opposition was at first encountered. But time has proved the expeditious manner in which work can be executed, the saving in labour and paint, and the durability of painting done in this way compared with brush work; and with such benefits as these, it is not surprising to learn that the system is making considerable headway. Messrs. A. C. Wells and Co., of Midland Road, St. Pancras, the makers of the "Lightning" painter and lime and colour washer, have called our attention to this progress; and the list they furnish of engineering and other industrial companies and firms of high reputation who have adopted their system is sufficient guarantee that its merits are such as to command recognition from those whose judgment it would be idle to dispute. In the list, we notice two of the London and several provincial and foreign gas companies and authorities. The outward form of the Wells apparatus, and its general principle—the spraying of the paint through a flexible tube and nozzle by means of compressed air—are well known; but the main features of the machine may be briefly described. The principal part is a cylindrical tank, constructed of sufficient strength to withstand the required air pressure, and provided with a screw-down cover. Supported on two lugs inside the tank is the pot for containing the paint, varnish, tar, limewash, or other liquid to be used. This pot being removable, can easily be replenished or changed for a pot containing a different colour. In connection with the cover provision is made for agitating the paint, in order to keep it of uniform consistency; and also affixed to the cover is the pipe for conveying the paint from the bottom of the container up to the flexible hose—this being accomplished by compressed air exerting a pressure on the surface of the paint. In works where air under pressure is already employed, special means of compression are not required; all that is necessary being the connecting up of the machine to the existing supply. But in other cases a compressor is supplied, which can be driven by a belt or any motor. For high speed work, the air must be supplied to the tank already described at a pressure of (say) 25 lbs. per square inch. From the tank run two flexible tubes—one conveying compressed air, the other the paint or other liquid to be used, and both ending in a hand-spraying arrangement. The sprayer is a very ingenious piece of mechanism, can easily be adjusted for fine or coarse work, and is readily taken to pieces for cleaning. The blocking up of the paint tube is a difficulty that has been raised; but this can be obviated by simply cleaning the tube, by means of the apparatus itself, with turpentine or paraffin. The machines are made in various sizes according to the magnitude of the work on which they are to be employed; and the larger sizes are adaptable for two operators, who can work over a space of at least 20 feet on either side of the machine. In addition to the rapidity and economy of this form of painting, there are several other claims of superiority over hand work with which engineers are cognizant, and which therefore need no reiteration here.

The Repayment of Loans for the Purchase of "Slot" Meters and Stoves.—A question having arisen as to the amount of depreciation to be allowed in the case of prepayment meters and stoves, we understand that the period usually allowed by the Local Government Board for the repayment of loans sanctioned by them to local authorities for the purchase of ordinary meters and stoves is ten years; and the Board have no information in their possession to show that this is excessive in the case of prepayment meters and stoves.

REGISTER OF PATENTS.

Incandescent Gas-Mantles.—Helmecke, H., of Hamburg. No. 8058; April 17, 1899.

In his specification, the patentee remarks: For several years attempts have been made to improve upon Dr. Auer von Welsbach's invention for manufacturing incandescent mantles from oxides of certain earth-metals mixed together, wherein it was tried to harden the mantles and render them more durable, partly by the modified chemical composition of the ingredients, and partly by exterior influences to which the mantles were subjected. But all these attempts, he says, "failed more or less to fulfil their purpose, since the augmented durability and strength has only hitherto been obtained at the expense of their brightness and illuminating capacity." While at the present time the manufacture of mantles is almost exclusively effected from a mixture of about 99 per cent. of thorium oxide and about 1 per cent. of oxide of cerium, in the form of the nitrates of these oxides, the present process is different both in its means and in the qualities of the mantles made; "rendering it possible to produce a mantle of prevalent illuminating intensity, agreeable for the eyes, and of far greater durability, without the use of thorium and cerium salts." This is done by employing a mixture of calcium oxide, in the form of calcium nitrate, with oxides used in the form of nitrates of certain earth-metals, as, for instance, lanthanum, zirconium, yttrium, and the like. It is mentioned by the patentee that in practice it is better to use the salt soluble in water of the first metals, and the nitrates are preferable to the chlorides and acetates. Pure oxide of calcium is neither practicable alone nor mixed with most of the above-named substances, because it needs too much heat to bring it to the necessary state of incandescence, and is liable to contract or retreat.

Such disadvantages to the use of calcium oxide for lighting purposes are, however, said to be entirely avoided in the present method. The light-radiating power of the mantles arranged on ordinary bunsen burners for normal pressure and gas consumption, is claimed as "excellent;" photometric measurements showing an intensity of light equal to 60 to 70 Hefner candles. The colour of the light can be modified as desired (according to the composition of the chemical ingredients), from bluish white, pure white, to golden white. The durability of structure is attained without prejudice to elasticity; and the mantle contracts far less, even after long use, than one made of cerium or thorium oxide.

The process of impregnating the cotton, silk, or the like fabric, the drying, incinerating, forming, and hardening over the gas-flame, &c., are analogous to the hitherto used methods.

It may be stated that mantles of calcium oxide and other metals hereafter mentioned after incineration (although calcium oxide is in molecular mixture with the oxide of the earth metals) are not hydroscopic.

The following solutions, for instance, are said to produce very good results:—

1.—Colour of the light, bluish white

Distilled water		100	parts
Calcium nitrate	about	10	,,
Zirconium nitrate	,,	15	,,
Lanthanum nitrate	,,	5	,,
Yttrium nitrate		0·5	part

2.—Colour of the light, bluish white

Distilled water		100	parts
Calcium nitrate	about	14·5	,,
Zirconium nitrate	,,	12·5	,,
Yttrium nitrate	,,	3	,,

3.—Colour of the light, pure white

Distilled water		100	parts
Calcium nitrate	about	10	,,
Lanthanum nitrate		10	,,
Zirconium nitrate		10	,,

4.—Colour of the light, gold white

Distilled water		100	parts
Lanthanum nitrate	about	14	,,
Zirconium nitrate	,,	9	,,
Calcium nitrate	,,	7	,,
Yttrium nitrate		0·3 to 0·5	part

5.—Colour as before, only a little whiter

Distilled water		100	parts
Lanthanum nitrate		11·5	,,
Zirconium nitrate	about	11·5	,,
Calcium nitrate	,,	7	,,
Yttrium nitrate		0·1 to 0·5	part

The colour of the light from mantles made with the third solution is given as pure white; but if the lanthanum used is not pure (but contains traces of didymium or cerium), the colour of the light would be "gold white."

Purifying Acetylene.—Ernst, O., and Philips, A., of Hoechst-on-the-Maine, Germany. No. 11,041; May 26, 1899.

The patentees point out that, among the solid materials which are capable of purifying acetylene from its impurities (phosphoretted hydrogen, ammonia, and hydrogen sulphide), the salts of hypochlorous acid are very advantageous, on account of their acting well in the dry state and their cheapness. The calcium salt takes the first place among the hypochlorites—being easily obtainable in the form of bleaching powder. Certain obstacles are, however, incidental to the use of bleaching powder in its commercial form, and render its application to the purifying of acetylene impracticable.

The purifying material, according to this invention, is obtained by mixing the hypochlorite and some substance indifferent to acetylene with water, so as to form a stiff sludge or paste, and then spreading out the sludge or paste in a thin layer, and drying it at such a temperature that no decomposition of the hypochlorite will occur. For admixture with the hypochlorite, all substances may be used which, on the one hand, have no deteriorating influence on acetylene, and, on the other hand, yield a highly porous material when mixed with the salt and subsequently dried. In the first rank is placed slaked lime, calcium carbonate, or similar substances. Calcium chloride can also be, with

advantage, employed as an indifferent diluent, because it gives up its water of crystallization when dried—forming bubbles and pores. Most kinds of commercial bleaching powder contain, in addition to hypochlorite, slaked lime and calcium chloride, in quantity sufficient to admit of their being treated in the manner already explained without further admixture; but the following examples represent working methods of preparing the material:—

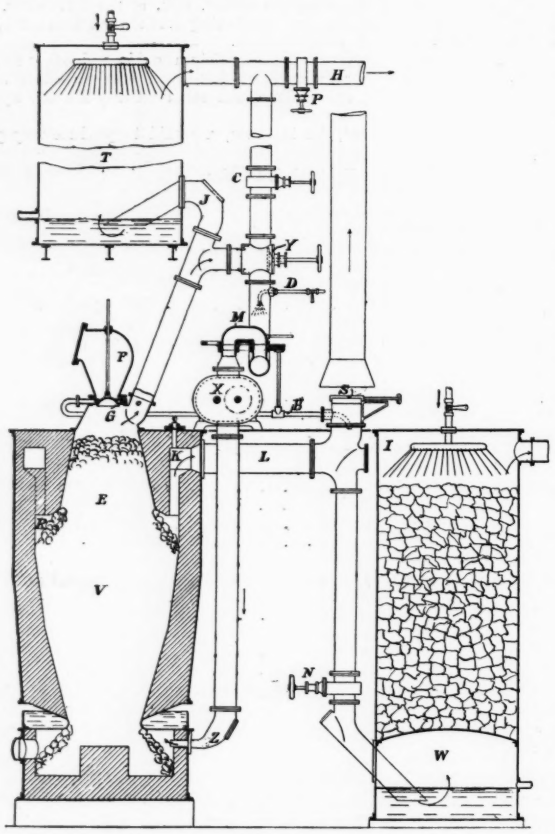
Example I.—Twenty kilos of bleaching powder are stirred with water into a uniform stiff sludge or paste, and treated with a similar sludge or paste made by mixing five kilos of slaked lime and five kilos of calcium chloride and some water. The two pastes are thoroughly mixed, and dried *in vacuo* at 100° C.; it being advantageous to spread the material in comparatively thin layers on drying trays. The mass, on drying, becomes highly porous, and sufficiently hard to allow of its being broken into pieces of convenient size without falling to powder.

Example II.—Fifty kilos of bleaching powder are stirred to a stiff sludge or paste with thirty kilos of water, and treated with forty kilos of calcined sodium carbonate, while stirring. The well-mixed paste, which now contains sodium hypochlorite and calcium carbonate as a result of decomposition, is mixed with ten kilos of calcium chloride, and then dried, preferably *in vacuo* at about 90° C. This also yields a highly porous, solid material for use in acetylene purification.

Production of Heating Gases, Poor in Nitrogen, from Combustible Materials Containing Hydrocarbons.—Blass, E., of Essen-on-the-Ruhr, Germany. No. 17,053; Aug. 22, 1899.

This invention has for its object the generation of gas from, and the gasification of, combustible materials containing hydrocarbons—such as bituminous coal and the like—in such a manner as to obtain, broadly speaking, a heating gas poor in nitrogen.

Not only is a portion of the carbon converted into heating gas poor in nitrogen, but all the hydrocarbons are obtained in the form of gas, or as tar and the like, or, after their decomposition into carbonic oxide and hydrogen, as hydrogen gas. This is effected by distilling the fresh combustible material by the aid of hot non-condensable hydrogen, and converting the coke resulting therefrom into hydrogen. In order to ensure complete distillation, a special arrangement has to be adopted for supplying the coal constantly with freshly re-heated hydrogen until the coking is complete.



The apparatus for carrying out the process consists mainly (as shown) of the following parts: A single sheet-metal cover encloses the chamber E for drawing off the gas, and the chamber V for distilling. Above the apparatus is fitted a charging-funnel F, adapted to communicate with the chamber E through an opening normally closed by a valve G. This valve serves for the purpose of cutting off the chamber E for drawing off the gases from the hopper F whenever the hopper is to be filled with fresh coal. As soon as the hopper is charged, the cover is closed and the valve G is opened, so that the coal can drop into the chamber E. To prevent the collection of any noxious and explosive gases in the hopper above the valve G, an annular passage is provided which communicates, by a pipe B, with the exit L for water gas or generator gas; so that the passage is filled with these gases, which in the absence of air are inexplosive. Below the distilling chamber is an inlet-nozzle Z for the admission of an air-blast or mixture of gas and steam. At the junction of the two chambers (about the middle of the apparatus) an annular hollow space R is arranged free of the combustible material; and the gas there collected is led off through channels and delivered into a circular channel K, and thence into the pipe L, which latter is fitted with a closed outlet S, and with a branch leading into the scrubber W. Below the charging-funnel F is an opening O, through which the gases are drawn off by the exhauster X, so as to pass either along the shortest route through the open valve Y; or when this valve is closed, they pass to the refrigerator T through the nozzle J. The pipe D is a steam-supply pipe.

The operation is as follows: The coke in the distilling chamber V (distilled coal and the like from above) is heated by the air from the inlet-nozzle Z. The gas then generated rises up into the circular channel K, and is either allowed to escape into the atmosphere by opening the valve S, or is led off to any suitable place for use. After the combustible material is sufficiently hot, the valve is reversed; and thereupon gas production commences for the generation of the heating gases poor in nitrogen. The valves S, P, and C are closed; the valves N and Y are opened; while the slide-valve M is set as shown. The fan X thereupon draws off the gases of distillation, which, together with the steam from the pipe D, pass through the nozzle Z into the coke. The mixture of gas and steam flows through the burning coke, and is decomposed into hydrogen gas. The hot hydrogen gas thus produced is drawn off through the chamber E; and during its passage upwards, it degasifies the fresh combustible material, while at the same time a certain amount of the gas travels up the passages into the circular channel K, and through the pipe L to the scrubber W, and finally into the gasholder.

If, now, the temperature in the coke-chamber sinks so far that the generation of hydrogen is very small—that is to say, that the decomposition of the steam becomes unprofitable by reason of a large portion of the steam escaping undecomposed through the coke, while the percentage of carbonic acid in the generated gases rises unduly—the steam supply is stopped; but the fan is kept working. This is the commencement of the second phase of the gas production. The circulation of the gas mixture by means of the fan-wheel X (now, however, without steam) continues; and the heat from the coke, which is still fairly high, is communicated to the circulating gases, and these in turn give the heat up to the incompletely distilled coal. This circulation proceeds until the coal has practically given up all gas; so that not only all the distillation products are made use of from the yield of gas, but at the same time all the necessary coke for conducting the process is obtained from the distilled coal. After the coking of the coal is completed, the apparatus is reversed by turning the valve M.

During the process, the tar and ammonia may be extracted from the circulation gas mixture, which contains all the products of distillation. To this end, the valve Y is screwed down; the slides S and P closed; and C and N opened. Thus the gas mixture is caused to pass through the pipe J into the refrigerator T, where it deposits tar and ammonia. The exhauster draws the gas now freed from tar and ammonia, and causes it to circulate after mixing steam with it for the first working period, or alone for the second working period.

The gas thus produced is hydrogen gas; but if it is desired to produce a mixture of hydrogen gas with non-decomposed distillation products (illuminating gas), the excess of gas is not allowed to pass off from the annular space R, but is caused to mix and ascend with the circulating gas current through the fresh charge of combustible material for re-heating, and there become further charged with the products of distillation. This is effected by closing the valves S, N, and C, and having the valves Y and P open. A part of the gas mixture is drawn up by the exhauster, and circulated; while the other portion enters through the pipe J into the refrigerator T, so as to be freed from tar and ammonia, whence it passes through the pipe H immediately into the holder. The hot hydrogen gas loses most of its heat during its passage through the generating chamber; and therefore a scrubber is not required.

If it is desired to obtain as much as is possible of the bye-products tar and ammonia, the process last described is so far altered as to secure the tar and ammonia, not only from the portion of the gas which finally passes into the holder, but from all the gas which ascends through the pipe O. For this purpose, the valve C is opened, and the valve Y closed—so that the whole of the gas must pass into the refrigerator T; any excess being led off through the pipe H into the holder.

Automatic Gas-Lighters.—Trendel, F., of Berlin. No. 20,884; Oct. 18, 1899.

The patentee describes a process for producing solid igniting bodies for automatic gas-igniters (fire-resisting material being employed), the distinguishing feature of which is that the raw material is successively treated with boiling acids, water, alcohol, and ether; then dried and heated to red heat; and evaporated with a decomposable solution of a platinum metal until dry—the platinum salt of the igniting body being then reduced in the known manner.

Having experimented with former types of automatic lighters, the patentee sums up the experience he has gained as follows: (1) The more finely the platinum is distributed (that is the looser its structure), and the greater therefore its effective surface, so much the quicker its action. (2) The more molecular the distribution of the platinum in the volume of the igniter, the more lasting its effect. (3) The less foreign elements contained in the carrier for the spongy platinum, and the more porous, and fire and acid resistant it is, the more reliably will the igniter act; and it will be the more capable of resisting atmospheric action, as from damp, nitrogen, carbonic oxide, carbonic acid, ammonia, sulphide of hydrogen, acid vapours, and the like.

With this experience as a basis, he claims to have succeeded in discovering a process for manufacturing igniters which possess the qualities just enumerated in a high degree, and therefore are quicker, more lasting, and more reliable in their action.

A fire-resisting substance—as, for example, clay, infusorial earth, meerschaum, &c.—is digested for about 24 hours in pure hydrochloric acid, having a specific gravity of 1·124; boiled therein; and then boiled again in hydrochloric acid until a sample leaves no red residue. The material is then washed with hot water until it indicates no more acid; it is then digested with absolute alcohol; then again with sulphuric ether; and after that it is placed in a platinum vessel, in which it is slowly heated to red heat. In this manner, a substance is obtained which, in regard to its chemical composition and molecular structure, is quite different to that originally employed. It is distinguished by an extraordinarily high

degree of porousness, and is free from all organic admixtures or compounds soluble in, and decomposable by, acids—it consists exclusively of durable silicates. The material, with a solution of platinum chloride or other soluble decomposable salts of the platinum metals, or a mixture of them with soluble salts of other metals which, after being reduced, leave a fire-resisting residue behind—as, for instance, the metals of the rare earths (thorium, zirconium, &c.), and other metals—is evaporated almost to dryness; then completely dried *in vacuo;* and reduced in any known manner. The igniter is thereby finished without further handling.

By this chemical treatment, meerschaum, for example, is reduced to one-half of its original weight; so that one-half the mass with the same volume is obtained, which doubles the porousness and susceptibility for the platinum salt solutions, and consequently increases the effective surface of the spongy platinum considerably—enhancing essentially its molecular distribution.

APPLICATIONS FOR LETTERS PATENT.

5205.—Burtles, H., and Sigurdsson, O. V., "Automatically turning gas on or off at predetermined times." March 19.

5249.—Sala, J., "Gas and liquid burners." March 20.

5344.—Kinnedy, R., "Prepayment meters." March 21.

5357.—Lisle, E., and Prew, G. F., "Carburettors." March 21.

5366.—Knöfler, O., "Incandescence bodies for gas lighting." March 21.

5374.—Preston, E. J., and Conway, F. L., "Intensifying and reducing fluid pressure." March 21.

5397.—Colman, H. G., "Enabling gas-meters to be used under pressures other than that of the atmosphere." March 22.

5398.—Colman, H. G., "Automatic alarm for showing excess of pressure in gas-purifiers." March 22.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Naphthalene in Coal Gas.

Sir,—I notice in your issue of this week a letter from Mr. R. W. Allen, in which he refers to my estimations of the vapour tension of naphthalene at ordinary temperatures and other matters connected therewith.

In reply, I may say that the rate at which I passed the dried air through the naphthalene was much greater than in Mr. Allen's experiment, though not so great as in another he quotes, where he found a deficiency of about 6 per cent. I found, however, that if I allowed a current of air to pass through the naphthalene for an hour, then let the experiment stand for a day or two, and afterwards passed the air through the naphthalene for another hour, I obtained a higher result than I did without the intermission. The cause of this discrepancy, I cannot say—possibly it may be due to the decomposition of some unknown impurity; but it gave me considerable trouble in my experiments.

Calculated to grains of naphthalene per 100 cubic feet, my figure for 25° C. or 77° Fahr. was 24·0; Mr. Allen's, 30·9. My figure for 15° C. or 59° Fahr. was 9·0; Mr. Allen's 19·0. Now vapour tensions at different temperatures vary according to a fairly general law; and Rankine's formula for constructing a table when three constants are known is, I believe, nearly correct. Mr. Allen's figures for temperatures over 30° C. are probably not far out; they being easier to obtain with accuracy than the low temperature results. Take the following items from his table:—

At 55° C.	Mr. Allen's figure is	317·0 grains.
45° C.	do.	132·0 ,,
35° C.	do.	57·5 ,,
25° C.	do.	30·9 ,,
15° C.	do.	19·0 ,,

According to law, $\frac{\text{VT at 45° C.}}{\text{VT at 55° C.}}$ should be slightly greater than $\frac{\text{VT at 35° C.}}{\text{VT at 45° C.}}$; and so on as the temperature decreases.

In the same way $\frac{\text{VT at 35° C.}}{\text{VT at 55° C.}} > \frac{\text{VT at 15° C.}}{\text{VT at 35° C.}}$; and supposing Mr. Allen's figures at 55° C. and 35° C. are correct, then the figure for 15° C. should be slightly less than $\frac{57{\cdot}5^2}{317}$—*i.e.*, less than 10·4.

In the same way VT at 25° C. should be less than $\frac{57{\cdot}5^2}{132}$—*i.e.*, less than 25·0; so that Mr. Allen's figures for high temperatures confirm mine for low.

It is, indeed, this very rapid decrease of vapour tension with decrease in temperature, as shown by my figures, which occasions the ready formation of naphthalene deposits in the mains and services.

My method of testing naphthalene in gas, by passing a few hundred cubic feet through benzene or toluene, and distilling through a fractionating column, may be cumbersome, and not as scientifically accurate as one would wish. But it has the merit of giving the naphthalene in the form of a crystal which can be handled and weighed; and as a comparative method it is valuable. One can also determine the other high-boiling condensable products in the gas at the same time. By it, at all events, Mr. Allen would never find a gas free from naphthalene which deposited it in the mains.

Manchester, March 28, 1900. Wilfred Irwin.

Sir,—With regard to the consideration of this subject, nothing could have been more *apropos* than the publication in last week's "Journal" of the full text of the paper by Dr. Colman and Mr. J. F. Smith, the reading of which ante-dated Mr. Allen's recent contribution. As a discussion on the naphthalene question is now going on in your columns, I should like to add a few brief remarks on the subject. Scientifically, both papers are of great interest and value; but I do not consider that the much worried gas manager will learn anything to help him to a practical solution of the old and vexed questions of naphthalene deposits with all their irritating consequences. With regard to Mr. Allen's theory of the possible and absolute formation of naphthalene *ab initio* in the mains, such an assumption seems to a certain extent to be corroborated by his figures, but so far is to my mind not absolutely proved. To establish such a theory as a fact would entail one of two proofs—

1.—That naphthalene can be formed by some interaction of the normal constituents of coal gas, or of their contact with metallic iron, demonstrated by conclusive laboratory experiments.
2.—That gas could be supplied from the works free from naphthalene, to a district fitted throughout with perfectly new and unused pipes, and yet naphthalene deposits be formed.

Leaving this question of naphthalene formation, and turning to matters of more tangible interest in the papers, I consider that the most valuable additions to our knowledge are—

1.—That the normal amount of naphthalene present in ordinary gas is so small as to range from *nil* to 1·5 grains per 100 cubic feet.
2.—That the presence of the vapours of certain compounds in limited quantity in coal gas, which have been previously considered as tending to retain naphthalene in the gas, does not exercise any such action, even when existing in abnormally large quantities.
3.—The publication of two distinct methods by which the proportion of naphthalene in gas can be fairly accurately determined.

Mr. Allen's facts with regard to No. 2, seem certainly incontrovertible; but they are utterly against all practical experience. Speaking subject to correction, I believe that the higher the illuminating power of the gas supply, the less the prevalence of naphthalene deposits, and *vice versâ*. To what is this due, if not to the solvent action of the higher hydrocarbons on naphthalene? Or is it to be explained by the higher-grade gas being produced at a lower temperature, and thus being initially charged with less naphthalene? Further, increased illuminating power may be obtained by the use of cannel gas; and this contains a different class of heavier hydrocarbons, and may contain little or no naphthalene. There would, however, still have to be explained the popular impression that the temporary use of high-grade gas (presumably derived from the employment of an abnormal percentage of cannel) absolutely removes or minimizes previously formed naphthalene deposits in any particular district. It is, I believe, found that the use of carburetted water gas very much conduces to freedom from naphthalene deposits. Theoretically, this should be the case, as I presume that such gas would not, *ab initio*, contain naphthalene. This substance would not presumably be formed during the action of superheated steam upon heated coke; neither would it be likely to be to any extent a product of the breaking up of liquid paraffins into permanent gases by the use of a high temperature.

On the questions of the presence or absence of naphthalene in ordinary coal gas, in cannel gas, and in carburetted water gas, we have now the means of forming an opinion and of obtaining experimental results, and, if necessary, of making quantitative determinations. With regard to this branch of the subject, I consider that the process advocated for the detection and determination of naphthalene by Dr. Colman and Mr. Smith is better than that of Mr. Allen. Although I have made no experiments on the subject, the details of working are I think in its favour. It is comparatively simple, and can be used on a fairly large volume of gas passing at a comparatively rapid rate. It is a volumetric method, which is also a great advantage; and the ratio of the molecular weights of picric acid to naphthalene is conducive to accuracy (one part by weight of the former representing a little over one-half of the latter). There is only one point needing a little elucidation—viz., the question of the solubility of naphthalene picrate in pure water. In the table given, where an abnormal quantity of wash water was used (over 100 c.c.), the gross error was only 0·014 gramme on 0·150 gramme taken; but the solubility of the picrate in water is stated as 0·1857 gramme at 14° C. This would equal (say) half the quantity of naphthalene, or about 0·09 gramme. How does the precipitated naphthalene picrate settle? If completely and solidly, why not titrate a portion of the clear acid solution after settlement, and avoid the possible errors of wash water? The error might be serious on a determination of (say) 1 grain of naphthalene per 100 cubic feet of gas—0·1 grain, or 0·065 gramme, in 10 feet.

Reverting to Mr. Allen's paper, there is one point which is not quite clear to me. When giving results to prove the absence of naphthalene in gas, it was found (quoting from the "Journal" report of the paper) that, at a temperature of 130° Fahr., 1·25 cubic feet of gas took up 153 grains; but referring to Table II., at a temperature of 131° Fahr. 100 cubic feet took up 317 grains. In both cases the figures refer to gas *saturated* with naphthalene.

March 30, 1900. H. Leicester Greville.

Sir,—In view of my (more particularly) practical investigations in regard to naphthalene, I cannot be other than struck with the remarkable theories put forward by Mr. Allen in his interesting paper, especially as for the most part his statements are diametrically opposed to what my experience has led me to regard as facts relating to the formation of naphthalene.

The ordinary precautions regarding the subject, as affected by the manufacture, have for many years past been taken at the Hastings Gas-Works; and I have seen evidences of naphthalene in the gas at all points of the manufacture. Indeed, although there has been nothing of any consequence in the way of deposits, naphthalene could undoubtedly be found in most parts of our apparatus.

On this subject, I have often found myself in accord with the remarks of Mr. Lacey; and I should like to emphasize what he said in the discussion on Mr. Allen's paper, in regard to the conditions under which the experiments were made by Mr. Allen being so different to those existant in the actual practice of distribution, &c., as to raise doubts in one's mind regarding the application of the same. Like Mr. Lacey, too, I have never found any difficulty in understanding why trouble from naphthalene has not been experienced in works using high-class coals; much naphthalene will be found in the tar produced by such coals.

With reference to what Mr. Butterfield said on one point, I should like to mention that some years ago, when first the carburation process was started here, a piece of service-pipe which had become choked with a deposit of naphthalene was, by way of experiment, successfully cleared by passing carburated (by petroleum) gas through it. The most convenient point at which this could be done happened to be on the supply to a jet photometer on the outlet of the carburater; and it was noted (there being

also a photometer on the inlet of the carburater) that there was a distinct increase in the illuminating power. Following this, I may say I have found gas treated by the carburation process has its capacity for naphthalene increased; and it appears just conceivable that some deposit of naphthalene existing between the points of his testing might account for what Mr. Allen states.

Of late there has undoubtedly been a great revival in the interest in the naphthalene question, a fact to which Mr. Allen's paper bears testimony, and will therefore be welcomed by myself and all others investigating the subject. There are, however, a great many points still to be cleared up—for instance, what is the reason that in certain cases the introduction of carburetted water gas has actually resulted in increased trouble from naphthalene, instead of the popularly supposed freedom?—points, indeed, to which I am only waiting time and opportunity to give careful attention; and in this connection Mr. Allen's method (or, indeed, Dr. Colman's) of estimating the naphthalene in coal gas, if found reliable in less skilled hands than his, will prove a valuable assistance, since other methods employed are much more tedious. Notwithstanding the troubles some companies still experience, it is correct to say that deposits of naphthalene in the distribution of gas (whatever the theory) can be avoided nowadays, which is proof that the attention already given to the subject has not been applied in vain.

CHAS. F. BOTLEY.

Hastings, March 31, 1900.

SIR,—From the number of letters on the subject of naphthalene of late (and some such learned ones), one may say it is on the brain just now. It is some 30 years since I came to conclusions on the subject which I have not seen cause to alter; and if you allow me, I will place them before your readers. But they must not expect a great deal of learned nomenclature.

I think the causes of naphthalene are various: 1. High heats, and consequent poor gas, where no cannel coal is used. In Scotland, where cannel coal is used, and the power of the gas is over 20 candles, naphthalene is *non est*. 2. Fluctuating changes of temperature after gas is made. 3. Sharp bends in the line of pipe. 4. Rough interiors of pipes. So much for hypothesis, now for my reasons.

1. At one of my works, we had recently lit up some new retort-settings that heated so admirably that I said to the manager: "I am afraid you will have naphthalene;" and soon we had it in the leading main from the works. This, they steamed by a portable boiler we had, with a water-tank and pump attached. This was only a temporary cure; and being there one day, I said: "Pump in some naphtha." It was no sooner in than there was a rushing noise inside the boiler that somewhat frightened the men. This was a much more effectual cure than steam; and when they pumped the syphons, the naphtha floated on the top of the water, and we got it back again for future use. The greater permanency of the naphtha over the steam cure, I attributed to the steam cleaning the interior of the pipe down to the cast-iron interior; whereas the naphtha vapour polished the interior of the pipe with a thin smooth glaze that less impeded the passage of the gas.

2. At one works the leading main from the meter to the gasholder was above ground for some 80 yards, till it reached the tank, where it sunk vertically through a T-piece with a flange on top. The hole that had been dug to get down to the pipe had not been filled in, and contained water all round the pipe. This main began to show signs of choking about the month of October or November. I concluded that naphthalene had been forming for some time, and only became troublesome as the make of gas increased. I took off the top flange of the T-piece, to jump the stand-pipe. I found some 6 or 7 feet of the pipe at the top end quite clean. I also found a crystal ring of naphthalene formed at the precise level of the water outside; and I concluded that change of temperature was the cause.

3. I knew a London Gas-Works where they had three station-meters in a line. The inlet passed behind with T-pieces for the first two of the meters. The inlet-pipe terminated at the third meter by a right-angle bend; and it was only this last meter that gave naphthalene trouble.

4. The service to my house got stopped. I had it carefully lifted—personally superintending the work. We found the whole of the service quite clean, except at one spot where there was a projecting burr at a joint; and a diaphragm of naphthalene had formed there quite beautifully.

Another cause of naphthalene is tapping mains for services on the top, instead of at the side of the main—thus requiring a bend on the top of the main just where the gas is getting cooler, and to street-lamps having to travel up the lamp-post—it may be in frosty weather. A thimble-full or two of naphtha poured down the stand-pipe will effectively clear it.

For large works everyone should have a portable steam-boiler such as I have described. For small works, something of the size of a 10-gallon oil-can could be mounted on wheels high enough to have a fire below it. It could then be filled two-thirds with water brought to boil. Then the naphtha added would pass into the pipes as vapour; or where steam is handy, naphtha might be injected into the pipes—much as we feed steam-boilers.

Just one other word in conclusion. I know that both managers and directors try for large makes of gas per ton of coal. I am of the same opinion as Mr. George Livesey. We say that more than 10,000 cubic feet of gas per ton of Newcastle coal is not desirable for either the company or the consumer. The wear of retorts, and the cost of fuel and labour, will not be compensated by the few hundred feet of thin gas that may be produced, with the chance of naphthalene to follow.

GEORGE ANDERSON.

35A, *Great George Street, S.W.*,
March 29, 1900.

The Proposed Visit of the Gas Institute Members to Paris.

SIR,—Will you kindly allow me some space for a protest against the letter of Mr. Shoubridge in your issue of the 20th inst.?

I was ever of opinion that lighting engineers—and gas-lighting engineers in particular—were united by the bonds of their friendship for "LIGHT." So it ought to be. But now Mr. Shoubridge comes, alas! to cruelly disturb this illusion. Still, I keep firmly to my opinion that there exists friendship between gas engineers, all friends of light, whatever be their nationality or creed, because I have had many proofs of its existence, which will ever remain a dear remembrance to me. Who among gas managers has not had, as I have, the experience that gas managers all over the world are always ready to help their colleagues with their experience and knowledge, whenever asked for? And, even when not asked for, the results of experiments and practical experiences are always published in the periodicals all over the world for the benefit of the friends of light. Therefore, friendship does exist between gas managers, *ipso facto* that they have a common friendship—that for "LIGHT."

It is enough to be a gas manager to be sure of a cordial reception in every place where gas-works exist; and we, Dutchmen, will never forget the splendid reception by our English colleagues in June, 1898.

I hope this letter will have the effect that none of the English colleagues of Mr. Shoubridge will follow his advice; and that Mr. Shoubridge himself will, after some consideration, be convinced that his words do not suit a gas manager—a friend of "LIGHT." Further, I hope that we Dutchmen will have the pleasure of warmly shaking hands with our friend Shoubridge and with many of his colleagues in September, at the Paris Congress, and that then not one discordant note will prevent the Paris Congress being, what it ought to be—"The Festival of LIGHT, celebrated by its best friends."

C. T. SALOMONS.

Gas-Works, Rotterdam, March 28, 1900.

The Law in Regard to Underground Water.

SIR,—However much the Institution of Surveyors or gas managers may be interested in this matter, there is no doubt that mining engineers, who are sometimes called upon to pump as much as 25 tons of water per minute, have much greater reason to feel a necessity for watching all legislation or decisions in respect of it.

The decisions hitherto in such cases as are alluded to in the paper by Mr. Shiress-Will, seem to illustrate the old legal maxim, that "Common Law is Common Sense." It would never do to decide that because I was pumping a lot of water at a distance of two miles from an old building which showed a few cracks, that it was my doing. The fact is one cannot prove the identity of water; but in this or a similar case, if one makes a big hole for a gasholder on the surface, and sand and water have clearly come through the dividing wall, the conditions do allow of some proof that the damage is a result of the excavation.

But this is not why I write you. It is for the benefit of such gas managers as have similar holes to dig in sandy or bad ground. What I say is, "Do not run any risks, and try by the use of such old-fashioned ideas as piling, to prevent the sides (and what is beyond) running into your holes; but send for the workers of the Poetsch freezing process. That is the only way to stop all risk of incursion by either quicksand or water." The beauty of it is, you can not only freeze the sides of the place as far as you like, but also the floor. That seems to me to be an idea which those who have to tackle such work should not lose sight of; and I make no charge for it.

A. L. STEAVENSON.

Durham, March 29, 1900.

Morecambe District Council Gas Bill.

SIR,—In this week's "JOURNAL" there is an error in the report of my evidence on this Bill. Speaking of the rise in the price of coal, the figure I gave was not 5s. 6d. but 1s. 6d. per ton, and that had reference to last season's rise. If the advance in the price of coal is to be as serious as is generally reported, then the price of gas will have to go up also.

T. NEWBIGGING.

March 28, 1900.

The Price of Coke in the North.

SIR,—It may interest you and your "Northern Coal Trade" correspondent to know that my neighbours and myself have been selling parcels of coke for shipment at 17s. 9d. per ton, f.o.b. West Hartlepool.

E. H. MILLARD.

Durham, March 28, 1900.

Notifying Increases in Price.

Managers of gas undertakings are having unusual experiences in many parts of the country, consequent on the changed condition of affairs brought about by the abnormal rise in the price of coal necessitating a readjustment of charges in an upward direction. For instance, the Gas Engineer of an important county town writes: "Would you kindly say what notice is usually given before an increase in the price of gas is made? I believe this Company has never had to do such a thing before; but it seems now to be unavoidable." It would be interesting to learn from other managers similarly situated what their practice is in this regard.

Armagh Gas Company.—General satisfaction at the position occupied by the Armagh Gas Company was expressed at the recent annual general meeting, at which the report of the Directors, who, as mentioned in the "JOURNAL" for the 6th ult., recommended the payment of the usual dividend of 2s. per share, free of income-tax (being at the rate of 10 per cent.), was adopted. The Chairman (Mr. W. J. Best), in the course of his remarks, said he thought the shareholders should be well satisfied, as the price of coal had gone up from about 13s. or 16s. per ton, at which the last contracts of the Company were made, to 24s. Fortunately, as the result of their foresight, they had sufficient coal to keep them going till July; but should the price not fall by then, the charge for gas would have to be raised. The thanks of the meeting were accorded to the Chairman and Directors, as well as to the Engineer and Manager (Mr. James Whimster), for their attention to the Company's affairs. The Chairman remarked that when Mr. Whimster became their Manager the price of gas was 5s. 10d. per 1000 cubic feet, and the dividend to the shareholders was 7½ per cent.; now it was 10 per cent., and the price 3s. 9d. and steadily decreasing. Mr. Whimster suitably acknowledged the compliment paid to him.

PARLIAMENTARY INTELLIGENCE.

Gleanings from the Committee Rooms.

There is little to record this week in connection with the work of the Parliamentary Committees; but that little is shown in the next paragraph to be of exceptional interest. The Committee who will have to consider the group of London Gas Bills continued last week, with as pleasant countenances as it was possible for them to assume, to plod through the bewildering maze which the antagonism of conflicting interests built up around the Lea Conservancy Bill; and day after day those concerned in the London Gas Bills saw the commencement of the proceedings deferred. It is now announced that the County Council Bill will be taken to-day; but it is hardly likely that any great progress can be made with the other Bills before the Houses rise for the Easter vacation.

Small Gas Bills occasionally produce great surprises—Lea Bridge did so last year, and Glastonbury has done so this. The Corporation of the latter town have been fondly imagining that, by gaining possession of the gas undertaking, they were going to net a nice little profit for the benefit of their own ratepayers; but their visions in this direction have been, to a large extent, dissipated by the decision of the Commons Committee who have been considering their Bill. Virtually, the Bill, as now amended, places the Corporation in the position of trustees for the consumers, with an allowance of 1 per cent. on the capital employed for their trouble in managing the concern. It will be seen later that this means a limitation of the surplus profits, over and above the amount required for the conduct of the business and for the repayment of and interest on capital, to the extent of the 1 per cent.; and anything above this will go in reduction of the price of gas. Thus the interests of the consumers of Glastonbury and Street will, under the new *régime*, and contrary to the usual order of things, have precedence over those of the ratepayers of the former town in regard to the profits derived from the undertaking. This is as it should be; and the consumers of both places ought to feel greatly indebted to the Street District Council for bringing about such a happy condition. The decision may also have a wider influence, by acting as a deterrent to the profit-grasping propensities of local authorities. It will at any rate be well for local authorities who entertain the idea of becoming the administrators of the gas supply, to consider carefully the bearings upon their own position of what has been done in this case. The proceedings also brought out conspicuously a point which is generally overlooked by gas consumers who are served by a sliding-scale company; and it is this, that it is to their advantage to do their utmost to thwart all efforts on the part of the local authority to purchase the gas undertaking. Local authorities do not offer any compensating advantage to the consumer for the loss of the protection and benefit afforded by the sliding-scale; their paramount object being, in most cases, to secure, without being trammelled in any way, the greatest possible profit out of the consumers.

To understand the conditions which brought about what was obviously a great disappointment to the representatives of Glastonbury, let us recall in few words the steps which have led up to it. Both the Glastonbury Corporation and the Gas Company promoted Bills this session; the former to enable them to acquire the gas undertaking, and the latter for additional powers. The Bills were referred to a Committee of the House of Commons; but before the Bills were reached by the Committee, the Corporation and the Company agreed upon transfer terms. The neighbouring Authority of Street felt keenly aggrieved by this settlement; and they forced a contest before the Committee. It may be remembered that last week we could not admit the justice of one of their requirements; but in other respects we agreed that they had very fair grounds for fighting, seeing that the consumption of gas in their district is no mean factor in the prosperity of the Glastonbury undertaking. This being so, very naturally they objected to profits being derived from the Street consumers for the sole benefit of the Glastonbury ratepayers; and they consequently proposed the removal from the Bill of the clause giving the Corporation power to carry surplus profits to the district fund. In substitution, they submitted one providing for the application of such surpluses to the reduction of the price charged for gas; but allowing the Corporation to make good from the profits of subsequent years any deficiency that might occur in the receipts. The next proposal from Street was a clause providing for the apportionment of the sinking fund between Glastonbury and Street according to the consumption of gas in the respective areas; so that, in the event of the purchase by the District Council of the part of the undertaking in their district they might be credited with their share of the sinking fund. There is a similar clause to this in the Ossett Gas Bill of this year, in regard to the portion of the undertaking in the area of the Horbury District Council; but it was inserted by agreement before the Bill was introduced. Another requirement of Street was that the Corporation should forward to them each year a statement of the gas accounts, and that Street should have power to verify them by a competent accountant. An equality of price clause was also proposed; and to this the Corporation did not object. These suggested extensions and amendments of clauses came before the Committee last Wednesday for their final discussion; and, as will be seen elsewhere, the principal ones met with some strong resistance from Counsel for the promoters. The evidence of Mr. H. E. Jones very materially helped Street. In the course of his examination, the point was raised as to whether the benefits which the sliding-scale bestows upon gas consumers could not be secured in some way under the administration of a local authority; but it was too big a question for a safe expression of opinion on the spur of the moment. The Chairman (Mr. Schwann) was responsible for the suggestion that the Glastonbury Corporation should be permitted, after all claims had been satisfied, to appropriate a percentage on the capital to remunerate them for their trouble in managing the concern. In the result the clauses of the petitioners were accepted by the Committee, subject to the proposed addition to the clause referring to the repayment of capital being adapted so as to meet the cases of both a sinking fund and repayment by instalments. Inspection of the accounts was limited by the Committee to once annually; and, as already stated, they gave the Corporation power to credit themselves with 1 per cent. on the capital employed as remuneration for the trouble of management. Thus Street obtained practically all they asked for; and the result is a distinct recognition of the necessity for protecting the interests of consumers placed in a similar position to those at Street. Had the Glastonbury Corporation known the fate that awaited their Bill, and the narrowness of the profit to which they were to be limited, they might have taken a different course before approaching Parliament. If they did not know it before, they have now learnt that the passage of a Bill through Parliament is beset with uncertainties.

On Thursday, the Corporation of London (Various Powers) Bill was in Committee. This is an Omnibus Bill, embodying clauses authorizing the Corporation to construct subways, or "public service works" as they are styled, in the City of London, and to compel the gas, water, electric, and other Companies who have power to open the streets and lay mains, wires, &c., to put them into the subways. The Bill also contains a clause conferring upon the Board of Trade the power to act as arbitrator, to settle the question as to the fitness of the "public service works" (when constructed) for the reception of the Companies' mains, wires, &c. The only serious opposition was from the two competing Electric Lighting Companies having powers of supply in the City—the City of London Electric Lighting Company and the Charing Cross and Strand Electric Lighting Company. The New River Company practically withdrew their opposition; and the Gaslight and Coke Company (the greatest user of subways) and the London Hydraulic Power Company did not appear. After being in Committee two days, the preamble of the subway section of the Bill was proved; and at a later date the clauses are to be adjusted to meet the requirements of the Committee. It was generally recognized that the nuisance caused by the pulling up of the streets would be obviated by the provisions of the Bill.

The opposition of the East Ashford Rural District Council to the Bill of the Mid-Kent Water Company has been withdrawn as the result of certain concessions made by the Company. Of the 15 parishes included in the Bill, Chilham has been struck out. As to Wye, Kennington, Hastingleigh, Sevington, Mersham, Smeeth, Brabourne, and Bircholt, the Bill is suspended for three years, to allow of a local supply being provided. The Company are prohibited from acquiring any wells without the sanction of the Council under seal, except the well of the South Eastern Agricultural College at Wye. The Council are also protected with regard to roads and bridges; and permission is given for them to take samples of the Company's water for analysis. The Company also are to supply any parish within 18 months after being called upon to do so, or lose their powers. The Company have authority to lay pipes through Chilham for the purpose of reaching other parishes in the Bridge district; and they offer to supply water in bulk to the Council on the following terms per 1000 gallons: Not exceeding 50,000 gallons, 2s.; exceeding 50,000 gallons, 1s. 6d.; exceeding 100,000 gallons, 1s.

HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Airdrie, Coatbridge, and District Water Trust Bill, Grantham Gas Bill, Hartlepool Gas and Water Bill, Morecambe Urban District Council (Gas) Bill, Ossett Corporation Gas Bill, Redhill Gas Bill, Wetherby District Water Bill.

Bill read a second time and committed: Rugeley Gas Bill.

Bills reported, with amendments: Cleethorpes Gas Bill, Falkirk and District Water Bill, Newtown and Llanllwchaiarn Urban District Gas Bill, Paignton Urban District Water Bill.

Bills read the third time and passed: Motherwell Water Bill, Newport (Mon.) Gas Bill.

The Exmouth and District Water Bill has been withdrawn.

HOUSE OF COMMONS.

Thursday, March 29.

METROPOLITAN WATER SUPPLY BILLS.

The two Bills promoted by the London County Council to enable them to acquire the undertakings of the Water Companies and carry out their Welsh scheme, and the Bill of the associated Water Companies to sanction the construction of further storage reservoirs in the Thames Valley, came again before the House to-day on the order for second reading. The London Water (Purchase) Bill was taken first; the discussion on this measure having been opened on the previous Thursday, and adjourned under circumstances which were recorded in the "JOURNAL" last week (p. 806).

Mr. STUART, in resuming the debate, said that when, on previous occasions, he had had to move a Bill similar to the one before the House, the main object of his remarks had to be directed towards endeavouring to establish the point that purchase was a good thing; that it was desirable, in the interests of the public, that water undertakings should be purchased by some public authority; and that the exigencies of the future supply of water would be best met by its being in the hands of such an authority. Fortunately, that which formed the largest portion of the contention about this measure on previous occasions—the desirability of purchase—now no longer needed to be argued; the matter having been definitely settled by the report of the last Royal Commission. It might be asked why the Bill was introduced at the present time. The reason was very simple. In the Staines Reservoirs Bill of 1896, there was introduced a clause, which was to be operative for seven years, providing that any concessions granted were not to be reckoned as an asset of a company if and when their undertaking came to be purchased. This clause would lapse in 1903; and, unless the purchase of this undertaking and those of the Water Companies who were working under a similar clause was effected before 1903, the object and intention of the Legislature would be frustrated. There was, therefore, urgency in the matter, because, even if the Bill were passed this session, it could not become law until towards the end of the year, and the arbitration under it could not be completed before 1902. Apart from the great governing principle of purchase, there were certain differences of opinion upon particular clauses. But the promoters were

prepared to make concessions. There was the question of separating the water supply in the sources as well as in the supply by bulk to the outside areas. The effort made to meet those areas had not been successful; and if it was the desire of the House that the clause should be modified, the promoters were perfectly prepared to agree. Another point was the arbitration clause. As to this, he was prepared to say, if they could get the Bill passed—if purchase could be secured this session—they would be willing to accept a clause which might not be so good as they could wish, but which would be on the lines indicated by the Royal Commission. If the Bill was not passed this year, then they could not give this *quid pro quo*—it would not be obtainable. As to the authority, they were perfectly prepared, in order to meet generally the wishes of all concerned, so as to secure purchase this year, to buy the undertakings in trust for any authority which might be created. The House would see that he was frankly dealing with the points at issue. It was for the Government to introduce a measure which should substitute another authority for the London County Council. The Bill could not therefore be said, as had been done, to be absolutely opposed to every recommendation of the Royal Commission. But there was this great point, that whatever body was nominated to manage the water supply of London, it must have recourse to the County Council to effect the purchase. In order to carry the scheme through, they must have some body which thoroughly understood the whole case. If they created a new body, it would have to spend years in making itself acquainted with the subject. A large number of the difficulties arose from the Water Companies themselves; and if these were out of the way, he believed it would at last become possible to construct an authority capable of managing the London Water Supply. He concluded by moving the second reading of the Bill.

Mr. Whitmore said his honourable friend made an interesting speech, but it was in support of a purely hypothetical Bill. What was the real principle of the one before the House? It was that the London County Council should be the purchasers of the water undertakings; and that, after purchase, they should remain the owners, and work them within the area of the Council, but that, as regarded the outside areas, the working should be transferred to the different local authorities. The House had previously, by large majorities, rejected measures of this kind; and the Council had recognized the futility of introducing fresh Bills. But in the summer of 1898 came the failure of the water supply in the East-end of London, and, in consequence, the Council introduced last year two Bills dealing with the question. Of these, the Welsh Supply Bill was met with an amendment that it should not be proceeded with before the Royal Commission had reported; and the Purchase Bill was ultimately withdrawn. The history of the question showed that the House had always refused absolutely to sanction the Council's main policy of purchase, and had attached great weight to the appointment and the report of the Royal Commission. At the beginning of this year, the Commission, after an exhaustive inquiry, issued a unanimous report. They came to the conclusion that the Council should not be the purchaser of the water undertakings, but that a new authority should be constituted for their acquisition and control. This report might be supposed to be absolutely conclusive against the second reading of the present Bill. But the honourable member coming to the House in a spirit of "sweet reasonableness," asked that the Bill should be read a second time in order that it might be completely transformed by a Select Committee. It was doubtful whether to read a second time a Bill which was to be completely altered was in accordance with the practice of the House; and, in any case, the future water supply of London was too important a matter to be left entirely to a Select Committee. The honourable member pleaded the extreme urgency of the question; but a year's delay could not make any practical difference. The stringent test imposed on the Water Companies last year by the exceptionally dry season proved their capacity to supply the whole of London in the most unfavourable circumstances; and as to the money question, even supposing that, in the interval, before a settlement was reached, the Companies added to their capital, and that the quinquennial valuation raised their assessment, the purchasing authority would obtain increased value for the higher price which had to be paid. The opponents of this Bill had been bitterly assailed on the ground that they were delaying the ultimate disposal of the question. He must repudiate any desire to interpose unnecessary delay into the settlement of the matter, which had too long inflamed passions in the County Council, and too long prevented the Water Companies from obtaining necessary facilities. Everyone must desire to have a settlement. He himself should have preferred to see an amalgamation of the Companies rather than the creation of a new authority; but he felt bound by the report of the Royal Commission, which declared amalgamation to be impossible. The general inclination was to accept the report of the Commission; and it only remained for the Progressives on the County Council to abandon still further their own preconceptions, and help to bring about a final settlement of the water question on the basis of that report. In the hope that the Government would soon give effect to those recommendations, he begged to move, as an amendment—"That the Bill be read a second time on this day six months."

Mr. Cohen, in seconding the amendment, said the House would not be justified in sanctioning a Bill which flew in the teeth of every one of the recommendations of one of the most strongly constituted Royal Commissions ever appointed to deal with the subject.

Mr. Buxton said he believed the County Council were practically prepared to accept the general conclusions of the Commission, and it was with this view that they desired that the Bill, the principle of which was the purchase of the Companies' undertakings, should go before a Committee. He supported the Bill because this was a matter of urgency. Next year the quinquennial revaluation took place in London, and this would unquestionably add to the income of the Water Companies and increase their capital value. He maintained that the Government had done nothing towards the solution of this question. They introduced a Bill in 1896 which was withdrawn; and last year their Bill enabling a slight amount of water to be acquired by one Company from another had been practically futile, because the Companies had been compelled to come to the House for further powers. There was no real matter of dispute between the two sides in principle; and he trusted the right honourable gentleman might see his way, even at the eleventh hour, to deal with this grave and most difficult question, and do something to redeem the pledges he had given.

Mr. Chaplin said the only discordant note in the debate had been struck by the honourable gentleman who had just sat down, when he taunted the Government with having done nothing towards the solution of the water question. The honourable member was apparently ignorant of the fact that, owing to the Bill passed by the Government last year, they were successful in preventing what would unquestionably have been the worst of all the water famines which had ever visited London. Leaving this, however, the House was in the peculiar position that it was asked to read a second time a Bill which was directly in conflict with the recommendations of the Royal Commission. The House, he thought, would require more cogent and convincing reasons than any which had been submitted to it up to the present time, before taking a course which would be extremely unusual. As to the Commission itself, the public and Parliament were much indebted to Lord Llandaff and his colleagues for their most able and exhaustive report, and for the care and attention which they had given to the subject. Neither must it be forgotten that in some most important conclusions they confirmed the findings of the previous Commission, presided over by Lord Balfour, and notably as to the sufficiency of the present sources of supply, both in regard to quantity and quality, provided adequate storage was secured. Summarizing the chief recommendations of the report, he pointed out that when the Commission came to the question of who should be the purchaser of the Water Companies' undertakings, they stated very explicitly that it ought not to be the County Council. They said the Water Board they proposed should be a permanent and not a fluctuating body; and they also recommended that the County Council should be very largely represented upon it. Further, they maintained that the present sources of supply in the valleys of the Thames and the Lea were sufficient in quantity and quality, and, with adequate storage, would continue to be so till 1941, even supposing that the population of the Metropolis continued to grow at its present rate of increase. They maintained, in the next place, that to embark just now on a scheme for bringing water from Wales would be to throw an unnecessary burden upon the present generation of water consumers and ratepayers and their immediate successors. It was obvious that to accept the Bill would be to go directly in the teeth of the recommendations of the Commission. On the other hand, the purchase of the undertakings of the Water Companies seemed at first sight so natural and reasonable, that he desired to say just one word about the chief reasons which had been given against the proposition. The fact was that the difficulty had always been what were known as the outside areas. It was in these that the great increase of population was to be looked for in the future. At the same time, those areas offered the most irreconcilable opposition to allowing the control of their water supply to be in the hands of the London County Council. No one had recognized this more than the members of the Council; so much so, that they had pledged themselves to make arrangements to hand over to the authorities of those areas the control of their own water supply. The question had been submitted to the judgment of the Royal Commission, and they reported that, although the severance of the works and the sources of supply of the several Companies, and the division of them between the Councils of the six counties within the limits, were not actually impracticable, they would be very difficult and highly undesirable. They would, the Commission said, involve needless waste and expense, and could only be carried out with constant friction in working details and at greatly increased cost of management. All the advantages and economies of concentration and amalgamation would, they said, be sacrificed; it would become increasingly difficult to deal with future wants; and no compensating advantage would be secured. This being so, and the County Council recognizing, he supposed, the difficulties of the situation, they now came forward with another proposal. They suggested that their Purchase Bill should be allowed to go forward, and that a clause should be inserted to enable the Metropolitan counties to introduce measures of their own next session, or subsequently, to constitute new authorities; or, to use the words of the honourable member opposite (Mr. J. Stuart), the Council were prepared to purchase "in trust." What he had to say to it was that it was one thing to bring in a Bill, and quite another to be able to pass it. Supposing anything occurred to prevent the passing of the Bill in the next or succeeding session, what would be the position? A good many things might happen before then. Supposing the constitution of the new water authority were objected to. The Council would be *de facto* the water authority, and the House would have made them the authority not only for London itself, but for all the outside areas. He could not believe that the arrangement was one to which the House would consent; and he could not say that there was anything in the plea with regard to urgency. It had been represented that any further delay would be injurious, especially on financial grounds. Certain clauses had been referred to, inserted in recent Bills, by which concessions were not to have the effect of being taken as further assets of the company. There was nothing to prevent similar clauses being inserted in other Bills which came before Parliament. With regard to the expiration of clauses in some existing Acts before the necessary measures could be passed, he was aware of only three cases of this sort. The clause in the Staines Reservoirs Act would expire in 1903, but not until the month of August—nearly four years from now; and if this matter could not be settled in the next four years, it was not likely, in his opinion, to be settled at all. There were provisions in two other Water Acts, one of which would expire in 1908 and the other in 1906. Surely these were times in which they would be perfectly safe. It had been contended before the Royal Commission that the effect of the next quinquennial revaluation would be to raise the worth of the undertakings of the Water Companies by £218,000 a year. It must be remembered that, although there was an increase in some cases, there was a decrease in others, and that railway and other large companies, who formed a very considerable element in the rateable value, had their water by meter. It had been shown that six out of the eight existing Water Companies would lose rather than gain by the next quinquennial revaluation. There was one question of great urgency, and that was the necessity for additional storage in the valley of the Thames. This, he considered, having given great attention to the subject, to be at the present time the most important and most urgent question in connection with the water supply of London. It was not necessarily affected by the postponement of these Bills. There were two Bills before Parliament for greatly increasing the storage for London—those of the East London and Lambeth Water Companies. The former Company had a proposal to increase their

storage by 5500 million gallons, and the latter one to increase theirs by 1000 million gallons. He regarded these proposals as of great importance. The East London Company introduced a similar Bill last year, which, to his great regret, was rejected by the House of Lords. On the question of being early in the field in Wales, so as to secure a watershed that would meet all possible requirements in a more or less distant future, he thought the matter well deserved careful consideration. Provision might easily be made for this in any legislation thought to be necessary on the subject; but it certainly was not a matter of immediate urgency for the present session. He had come to the conclusion that, in all the circumstances, there was nothing to warrant the House in taking a course so unusual as that proposed. He was sanguine that it would be possible for the Government soon to deal with this matter on a satisfactory basis; and, in conclusion, he would only express the hope that the honourable gentlemen opposite interested in this Bill would allow the discussion to be closed without going to a division.

Mr. J. W. Mellor, one of the members of the Royal Commission, referring to the lamented death of Mr. Cripps and Major-General Scott, two of his colleagues, said he knew from personal conversations with these gentlemen that, had they lived to the end of the Commission's labours, they would have agreed with the conclusion arrived at.

Mr. Burns supported the motion. He said that municipal control of the water supply had been granted to Glasgow, Birmingham, Manchester, and Liverpool, and why should it be denied to London? Until it was proved that the London County Council were incapable or dishonest, or desired to be unjust to the outside Local Authorities, there was no reason why they should not exercise the same functions in this respect as every corporate council in the United Kingdom. On all the grounds of trade, pleasure, health, and sanitation, this question could no longer be delayed.

Mr. Haldane said the question before the House was not whether the London County Council were to administer the water supply of London, but whether they were that day to take the first steps towards the execution of the policy of purchase which was recommended by the Royal Commission. What was asked was that the Government should make a beginning, and that it should be left to the future to decide who was to be the administrator. There was nothing in the speech of the right honourable gentleman which showed the Government were in earnest.

After some further discussion, the House divided, with the following result: For the second reading, 151; against it, 234—majority against, 83. The Bill was therefore rejected.

Mr. Stuart then formally moved the second reading of the London Water (Welsh Supply) Bill.

Sir F. Dixon-Hartland moved as an amendment, that the Bill be read a second time that day six months; contending that London had nothing to fear as to the future supply of water for its needs. He added that the purity of the Thames in recent years had enormously increased, and that the water was purer than could be found anywhere else.

Sir J. Dillwyn-Llewelyn seconded the amendment. He said that before the Bill was passed the inhabitants of Glamorgan should be heard, as they, at all events, ought to be supplied with water from their own hills. The County Council of Glamorgan opposed the Bill.

Mr. Stuart remarked that all the promoters asked was that the Bill might be sent to a Committee, who would consider the relative merits of the Thames and Welsh supplies, not only from a financial point of view, but on other grounds.

Mr. Burns, referring to a statement made by the honourable member for Uxbridge (Sir F. Dixon-Hartland), said that, according to the report for 1899 of the Engineer to the Thames Conservancy, proceedings had been instituted in 24 cases for non-compliance with the provisions of the Act in respect of pollution, and 16 convictions obtained against offending parties. To avoid this contamination, Londoners wanted to get their water from cloud-land in Wales, where there were no effluents from sewage farms or house-boats.

Mr. Brynmor Jones stated that the Glamorgan County Council opposed the Bill on the ground that powers so large ought not to be entrusted to one local authority, however important. They asked that the House would not give to the London County Council a first charge upon the natural resources of the Welsh counties. The second principle which operated against the Bill had reference to the case of counties and boroughs which were increasing in population from year to year, and were in close proximity to a watershed. Local authorities of such places had the first claim to the natural resources of the district. These were two broad principles on which he ventured to oppose the treatment of this great matter by way of Private Bill. He suggested that the Bill should be withdrawn for this year.

Mr. Chaplin said he wished to make a remark with regard to the observations of the honourable member for Battersea (Mr. Burns) as to the impurity of the supply from the Thames. It was very easy to quote from a report isolated passages which appeared to support one's argument; but the balance of authority was entirely against the honourable member. The whole of this question had been examined by two Commissions, both of whom came to the conclusion that, on the whole, the quality of the London water as supplied at present was admirable. Something had been said about the water authority of London being in the field in time to secure the reversion of a water area in Wales. This was a proposal for which he had a great deal of sympathy; and he thought it would be an exceedingly proper subject for the consideration of the future authority who should have charge of the water supply of London. But it would be quite out of place to entrust that duty to a body like the present, with regard to which the House had just decided that it should not be the authority in the matter.

Mr. Buxton, in recommending the withdrawal of the motion, said that the London County Council had done their best to carry out their duty by the ratepayers and water consumers, and to solve this most difficult problem. They had been thwarted by the Government, with whom the whole responsibility now lay to deal with the question. He himself was, however, not very sanguine that they would rise to the occasion and deal with the matter in a far-reaching or satisfactory way.

The motion and the amendment were then, by leave, withdrawn.

On the order for the second reading of the Metropolitan Water Companies Bill,

The Speaker said he had examined the Bill, and felt it to be his duty to advise the House that it was one which they could not properly entertain as a Private Bill. The promoters did not ask Parliament to confer any powers upon them, but invited it to bestow new and large powers upon a public department—the Local Government Board—to enable it to initiate and superintend a scheme for carrying out the recommendations of the Royal Commission on the London Water Supply, and for extending the provisions of a Public Bill of last session. These being the objects of the measure, it ought not to have been introduced as a Private Bill; and he trusted the honourable member in charge of it would withdraw it.

Mr. Boulnois, having acquiesced,

The order was then discharged, and the Bill withdrawn.

The following further progress was made with Private Bills last week:—

Lords Bills read the first time and referred to the Examiners: Higham Ferrers Water Bill, Newport (Mon.) Gas Bill.

Bills reported: Glastonbury Corporation Gas Bill, Glastonbury and Street Gas Bill [parties do not proceed].

Bills read the third time and passed: Airdrie, Coatbridge, and District Water Trust Bill, Grantham Gas Bill, Hartlepool Gas and Water Bill, Morecambe Urban District Council (Gas) Bill, Ossett Corporation Gas Bill, Redhill Gas Bill, Wetherby District Water Bill.

A petition was presented last Friday for the Portland Urban District Gas Bill, and was referred to the Examiners.

The British Gaslight Company (Staffordshire Potteries) Bill and the Wolverhampton Gas Bill were referred to a Select Committee, consisting of Mr. A. H. Brown (Chairman), Sir J. Woodhouse, Mr. Fison, and Mr. Arthur Moore; to meet on Thursday, May 3.

HOUSE OF COMMONS COMMITTEE.

Wednesday, March 28.

(*Before Mr.* Schwann, *Chairman, Mr.* Moon, *Mr.* Doogan, *Commander* Bethell, *and Mr.* Bonham Carter, *Referee.*)

GLASTONBURY CORPORATION GAS BILL AND GLASTONBURY AND STREET GAS BILL.

The object of the Corporation Bill was to enable the Glastonbury Corporation to buy up the undertaking of the Glastonbury and Street Gas and Coke Company; and the Company's Bill was to be withdrawn on the preamble of the Corporation Bill being passed. The only opposition was that of the Street Urban District Council, whose district immediately adjoins Glastonbury. The preamble of the Bill was found proved by the Committee last week (*ante*, p. 807); and the consideration of the clauses was postponed to allow the representatives of Street to formulate the suggestions they wished to make.

Mr. Balfour Browne, Q.C., Mr. Wedderburn, Q.C., and Mr. F. N. Keen appeared for the Glastonbury Corporation. Mr. J. D. Fitzgerald, Q.C., and Mr. Forbes Lankester represented the Street Urban District Council. Counsel were reserved on behalf of the Gas Company.

Mr. Fitzgerald said the first amendment was to strike out from the end of clause 52 the words "and the Corporation shall carry to the district fund so much of any balance remaining in any year of the revenue of their gas undertaking, and so much of the income derived from investments of the reserve fund when such fund amounts to one-fifth of the said aggregate capital expenditure, as may, in the opinion of the Corporation, not be required for carrying on, improving, or extending their gas undertaking and paying the current expenses connected therewith." This enabled the Corporation to carry to the district fund in relief of the rates the profits made on the gas undertaking. It was proposed to insert instead: "And, lastly, in reduction of the price of gas, when and as circumstances shall permit the same to be done; provided that the Corporation may retain in hand at the close of any financial year so much of the surplus as they shall think necessary for the purpose of carrying on the undertaking and paying the current expenses connected therewith." The effect of the clause was that the surplus profits, after paying all previous charges, should go in reduction of the price of gas. Unless some such provision was inserted, the position of consumers in Street would be changed very much for the worse. At present, under the sliding-scale, the extra profits, as soon as the standard dividend was reached, were divided between the consumers and the shareholders of the Company; there being for every increase of dividend a corresponding decrease in the price of gas. But under the Bill as it stood, the surplus profits would go, not to lower the price of gas, but to reduce the district rate of Glastonbury, in which the Street people had no interest at all. More than that, it would be to the interest of the ratepayers of Glastonbury, the majority of whom were not consumers of gas, to keep the price up, in order to increase the amount of profit to be contributed in aid of the rates of Glastonbury. What it was to their interest to do, there could be little doubt they would do. The answer of the Glastonbury Council was that, under clause 53, any deficiency in the net revenue of the Corporation on account of the gas undertaking was to be made good out of the general district rate. They said they were taking all the risk of deficiency, and therefore ought to have all the profit. The risk, however, of deficiency was of the smallest character. It was absolutely necessary, he agreed, to have the clause in the Bill, because under it the rates of Glastonbury were made the security for the money which the Glastonbury people would have to raise to purchase the gas-works; and this enabled the money to be borrowed at the lowest possible rate. But the actual risk of having to meet the deficiency out of the rates was very small indeed. To meet this point, a second amendment was proposed to clause 52, which related to the application of revenue, enabling them to make good any deficiency out of the district fund from the profits of subsequent years. It was: "In making good to the district fund any deficiency in the revenue and receipts of the Corporation on account of the gas undertaking which may at any time have been provided out of the general district rate or district fund." Thus Glastonbury was absolutely protected from any risk of the kind

suggested. There was a similar provision in the Stockport and Airdrie cases; and he contended that it did substantial justice on both sides. The only other amendment of clause 52 was with regard to the reserve fund, which the promoters proposed should be one-fifth of the aggregate capital expenditure. The ordinary proportion was one-tenth, and he knew no reason why one-fifth should be substituted. One-fifth would be an enormous reserve fund; and all the profits might be swept into it.

Mr. WEDDERBURN remarked that his learned friend need not worry about the proportion of one-fifth or one-tenth.

Mr. FITZGERALD said in that case he would go to clause 44, which stated: "The Corporation shall pay off all moneys borrowed by them on mortgage under the powers of this Act, either by equal yearly or half-yearly instalments of principal or of principal and interest combined, or by means of a sinking fund, or partly by one of those methods and partly by another or others of them; and subject to the provisions of this Act, the payment of the first instalment, or the first payment to the sinking fund, shall be made within one year from the date of borrowing the sum in respect of which the payment is made." Under the following sections, which it was proposed to add to clause 44, the method of repayment would be confined to a sinking fund which, speaking generally, was the most ordinary method of repaying principal.

(2) A sinking fund under this Act shall, until the completion of the purchase by the Street Council of part of the gas undertaking and works, mains, and plant of the Corporation by this Act authorized, or until otherwise agreed to by the Corporation and the Street Council, be divided into two parts, to be called respectively the Glastonbury Fund and the Street Fund; and every sum of money carried to the said sinking fund shall be apportioned between the Glastonbury Fund and the Street Fund in proportion to the gas consumed in the respective areas of the borough of Glastonbury and the district of the Street Council.

(3) In the event of the Street Council purchasing the part of the gas undertaking and works, mains, and plant of the Corporation which are situate within the limits of the urban district of Street, the price to be agreed or settled to be paid by the Street Council for such purchase shall be subject to deduction being made therefrom of the sum standing, at the date of the completion of the purchase, to the credit of the Street part of the sinking fund as hereinafter provided.

This clause would have no effect unless the Street Council purchased under the powers in the Bill the portion of the undertaking which was in their district. There was some discussion on the former occasion about inserting the "pipes" clause, which would have enabled Street to buy the works in their district without any regard to goodwill or profit; but he did not press for this. If, however, that were not given, it became necessary, in order to place Street in a fair position under the Bill, that a clause such as he had read should be inserted. Under the Bill, the sinking fund would be provided every year; and by the operation of the fund, the whole capital expended in the purchase of the works would be ultimately wiped out, so that at the end of 45 years they would have the works free of charge. Where did the sinking fund come from? It would be provided partly by the consumers in Street, and partly by the consumers in Glastonbury; and according as the consumption and the price of gas was larger in Glastonbury or Street, so the greater proportion of the sinking fund would be provided by Glastonbury or Street. Therefore he proposed that each instalment of the sinking fund should be credited in the books of the Corporation to Street or Glastonbury, in the proportion of gas consumed in the two districts in the preceding year. If ever Street wished to purchase their portion of the undertaking, they would have to pay to Glastonbury its full value as a profit-earning concern; and it was only reasonable that, when they did buy, they should be credited with the portion of the sinking fund which they themselves had provided.

Mr. MOON: Is there a precedent?

Mr. FITZGERALD: Yes; in the Ossett Corporation Bill this year.

Mr. WEDDERBURN: An entirely different case.

Mr. FITZGERALD said that the Ossett Corporation were purchasing; and there was another body outside—the Horbury District Council. An agreement was come to between these two authorities dividing the sinking fund in the manner he had mentioned; the only difference being that they agreed on a fixed proportion. Inasmuch as in the present case the consumption in Street was increasing very rapidly, it seemed fair to say that the actual consumption should fix the division of the fund. There would be absolutely no difficulty in dividing the fund in this way, because already, for the purpose of rating, the amount of gas consumed in the different places had to be ascertained, and the fund could easily be divided in the proportion of the respective consumptions.

Mr. BONHAM CARTER: The matter of the sinking fund in the Ossett case was one of agreement, was it not?

Mr. FITZGERALD: I said so.

Mr. WEDDERBURN: The whole thing was a matter of agreement.

Mr. BONHAM CARTER: The present case is one of agreement, so far as sale and purchase are concerned.

Mr. FITZGERALD: Yes; but there is no agreement so far as Street is concerned. They have never been consulted in the matter at all. The Street people are in the same position practically as Horbury was in the Ossett case. Continuing, he said the next new clause was to ask the Corporation to keep accounts in the ordinary way, which they would not otherwise be compelled to do. The clause was—

Until the District Council effect a purchase, the Corporation shall forward to the Council, on or before the 25th day of March in each year, an annual statement of accounts made up to the 31st day of December then next preceding, as near as may be in the form, and containing the particulars specified, in Schedule B to the Gas-Works Clauses Act, 1871; and the Corporation shall, at the request of the Council (if made within two months from the receipt of such annual statement of accounts), produce the books and accounts of the Corporation in verification of such annual accounts to any person duly authorized by the Council, and such person may, if the Council so desire, be a professional accountant.

Mr. WEDDERBURN: We do not object to that clause, down to 1871.

Mr. FITZGERALD said the second part—that following "1871"—was designed to enable the Council to see that the provisions of the Act were fairly complied with. If the provisions of the Act were fairly and properly carried out, the Corporation could have no objection to a verification of their accounts by a competent accountant. Unless they had something to conceal, or did something they ought not to do (which he did not suggest for a moment), they should have no objection. The last clause, which was as to equality, was—

The price to be charged by the Corporation for gas shall be the same to all consumers in similar circumstances throughout the limits of this Act; and no preference or advantage shall be given to consumers in the borough over consumers outside the borough.

Mr. WEDDERBURN: To that clause by itself we do not object.

Mr. FITZGERALD said on the last occasion he mentioned the maximum price, which was 4s. 6d. per 1000 cubic feet; the actual charge being 4s. After careful consideration, it appeared that if they granted consumers in Street the first two amendments, by which the profits were to go to reduce the price of gas and they were to have their share of the sinking fund, the maximum price of gas did not specially affect them; and therefore, if these two amendments were granted, he should not object to the maximum price remaining at 4s. 6d. But if the profits were not to go in reduction of the price, and it thus became the interest of Glastonbury to keep up the charge, he should have to deal with the maximum price.

Mr. *H. E. Jones*, examined by Mr. FITZGERALD, said it was only just that the profits should go in reduction of the price of gas, and not be carried to the district fund of Glastonbury. If the Bill were to pass in its present shape, the profits would go, not to reduce the price, but to reduce the district rate of Glastonbury; and none of the consumers in Street would receive any portion of the profit. There was practically no risk of a deficiency which would have to be met out of the district rate of Glastonbury. If there were a deficiency, the new clause would quite do away with any harshness. Moreover, the Arbitrator, in fixing the price to be paid when Glastonbury purchased the concern, would look to that risk. The whole point was met by the amendment that, if there should be any deficiency, it might be made good out of surplus profits in subsequent years. The amendment with regard to the sinking-fund clause was absolutely fair. He could conceive nothing more unfair than that the price of gas in Street should include, not only all usual expenses, but also a sum to provide interest on the capital invested and to redeem the whole of the capital over the period of 45 years, at the end of which time Street would have no proprietary interest in the concern. If the people in Street consumed half the gas, they would have purchased half the concern. To give Street credit for what it was charged with there all those years was only fair. Otherwise, if the Street Council were to purchase their share of the undertaking ten or fifteen years hence, they would pay the full value as it then stood, and get no credit for the contributions they had made to the sinking fund. Witness saw no objection to Street verifying the accounts.

Cross-examined by Mr. WEDDERBURN: He could give no precedent for the clause 52 amendment, except in the case of a joint board.

Mr. WEDDERBURN: You have said there is no possibility of loss. Are there not cases where a corporation or local authority have taken over an undertaking, and where, owing to the amount they have had to pay, they had to raise the price of gas?

Witness: I think that is only where the Local Government Board have insisted on the repayment of capital within too short a period. That was so in the case of Wokingham.

There have been instances where transfers have taken place, and the local authority have had to raise the price for some reason?—I know of no case.

Cross-examination continued: As to the maximum price, he agreed that coal was now very dear, and that there ought to be a margin for chance. In this instance, 4s. 6d. per 1000 cubic feet would not be a high maximum, if the other matters were put on a fair basis. Apart from those other matters, he would not speak as to the 4s. 6d.; but there should be some protection for Street. He could not suggest any precedent for the sinking fund proposal, except the case of Ossett; but it did not often occur that there was an adjoining area of consumption so important as in the present case—equally as important as that of the purchasing authority. He agreed that, under the Bill, Street were reserved their power of purchase; but purchase, where the concern was so small, would not be easy. It would be a pity if these two authorities split over the supply of gas. If each one supplied, they would very much increase the cost.

The CHAIRMAN: Do you know of any cases of the sliding-scale being applied to corporations?

Witness: No. The very essence of the sliding-scale is the spur to the shareholder to reduce the price of gas, in order to get the increment of dividend; and this does not arise in the case of a local authority.

Mr. BONHAM CARTER: There is a case, but I do not know how it worked out. There was a joint board.

Witness: I was not aware of it. I do not quite see what a local authority can get in the way of dividend.

The CHAIRMAN: Can you give us your objections?

Witness said he had no objection to it; but he saw difficulties in working it. He quite agreed, speaking off-hand, that it would be possible to devise some plan by which, as the Chairman suggested, say, 2 per cent. might be allowed the Corporation for their trouble and risk in working. He could not see why the sliding-scale then should not be made to apply so that the people should take an actual interest in the undertaking.

Mr. FITZGERALD pointed out that, under the Bill as it stood, one of the first charges on the gas revenue was the interest on the money borrowed, which included the whole capital.

The CHAIRMAN said that was true; but it did not pay Glastonbury for the trouble of working the concern, nor was there a guarantee in case of loss.

Mr. FITZGERALD said all expenses came out of revenue. The Chairman suggested 2 per cent. on the capital. Supposing the existing capital of the Company was £10,000, and that they were paying 10 per cent. on it, for this income they would probably get £26,000 from the Corporation. If the Corporation borrowed this sum, one of the first charges on the gas revenue would be 3 per cent. on that—about £700 or £800. If another 2 per cent. were added, they would be paying as much as, if not more than, the shareholders were now getting out of the concern—and that without regarding the fact that there was the sinking fund as well.

The CHAIRMAN said his idea was that they must give some remuneration to the Corporation who did the work. At present, they would have all the trouble, would find the capital, do the work, and receive nothing. If there was no profit over, there would be nothing to divide.

Mr. FITZGERALD said in the case of the London Water Companies, to meet the point there was an allowance of 1 per cent. for management trouble. In reply to Commander Bethell, he further said the reserve fund was to be built up, under the Bill, in precisely the same way as the sinking fund—by consumers in both places. When it reached the prescribed limit, the interest would go into the general revenue of the concern.

Mr. MOON (to witness): Would you be inclined to say that the Street Council clause is the nearest approximation to the sliding-scale in the case of a concern worked by a corporation, as distinguished from one worked by a company?

Witness: Certainly; so far as I have considered the subject. The Chairman has put a fresh proposition to me.

Mr. WEDDERBURN, for the Corporation, said they did not propose to call evidence; their view being that this was a matter for argument and common sense. The main value of the last witness's evidence was that he said there was absolutely no precedent for the two main proposals of Street. With regard to the 1 per cent. of the London Water Companies, he pointed out that they were very large undertakings, and that the matter was entirely different with them from what it was with a small concern like the present. The amount, however, he did not care to argue. The main point was the principle which the Chairman had introduced; this principle being that the Corporation of Glastonbury should not be the unpaid servant of Street—which was what Street had been struggling for all through. The proposals contained in the amendments were as unjust as any ever put forward. As to the maximum price to be charged for gas, it was absurd to suppose that the Corporation would not conduct the undertaking in a commercial spirit; and their object would be to make gas as cheap as possible, because the lower the price the greater the consumption. In order also to get the large consumption in Street, they would make the price as low as possible. Was 4s. 6d. per 1000 cubic feet unreasonable as a maximum? Glastonbury said it was not; and both Mr. Fitzgerald and Mr. Jones gave up much argument about that. It had been the price till the present Bill was introduced; and it could not therefore be said to leave much margin. As to the accountant's clause, Glastonbury objected to the Street Council having power to come in at any time and call for the books—or, in other words, to worry them. They had no power now under the general law to inspect; and Glastonbury wanted to leave them exactly as they were under the Company. With regard to the sinking-fund clause, Mr. Fitzgerald seemed to have entirely overlooked the condition of things under the Bill. Glastonbury was not absolutely bound to have a sinking fund, and was not going to have one; and the clause proposed would put upon them all the trouble and difficulty of such a fund, which the Corporation wished to avoid. Clause 44 gave them power to pay off the borrowed money by "equal yearly or half-yearly instalments of principal or of principal and interest combined." The latter was the method they would adopt, as causing the least trouble and expense. Then the clause went on, "or by means of a sinking fund, or partly by one of those methods and partly by another or others of them." Clause 45, which, like clause 44, was a usual clause, said if they determined to do it by sinking fund certain provisions should apply. So that they had power to repay in either way. But they would do it by the equal instalments; and they objected to being compelled to do it by the sinking fund. A member of the Committee asked as to what the sinking fund would involve them in. It would involve them in all the differences between the easy and convenient method and the inconvenient one. Apart from all this, there was no precedent for the proposed clause. The clause was brought forward because by agreement it was put into the Ossett Bill. Mr. Fitzgerald said Street was in exactly the position of Horbury. Well, he (Mr. Wedderburn) was Counsel for Horbury; and he held that the two cases were as different as could be imagined. The Ossett Corporation were seeking to purchase the Gas Company's undertaking, the area of which was Ossett and the outside district of Horbury. Ossett and Horbury met; and prior to the Bill coming before the House, they agreed that Horbury should support Ossett in their opposition to the Bill the Company were promoting for an increase of capital, and in the prosecution of the Ossett Bill. The combination resulted in saving Ossett the expense of a long fight, and gave them their Bill against the Company. But in this case, Street throughout had opposed Glastonbury. They had made it more difficult for Glastonbury to agree with the Company; and more difficult for Glastonbury to get their Bill. They had had every opportunity of combining, but did not do so. Then when Glastonbury had got their Purchase Bill, and agreed with the Company, they came, and, although they had opposed all along (and never helped Glastonbury as Horbury helped Ossett), they sought to gain as a matter of right what Horbury secured by agreement. Without bearing risk, or doing any work, they said they should be carried to as good a position as Horbury obtained. Anything more unjust could not be. The only parallel for the sinking fund was that it was given by Ossett to Horbury for things Horbury did. But there were other differences in the Ossett and Horbury agreement; for there was nothing to prevent Ossett making a profit. There was no such clause as was here proposed; it being provided that Ossett should carry to the district fund so much of the balance remaining in any year as, in the opinion of the Corporation, might not be needed to carry on the gas undertaking. Yet Mr. Fitzgerald said the Ossett and Horbury cases were parallel. Seeking nothing but their own selfish advantage, Street proposed that, though they might never purchase, Glastonbury should go on tying up money in the sinking fund which might be usefully employed. There was no parallel; and the fact that the clause, in quite different circumstances, and with different advantages, was given by agreement by one corporation to another district authority, was no ground for compulsorily and unfairly forcing it on Glastonbury. Turning to the alteration of clause 52, he said that again was entirely unprecedented. What was the reason Glastonbury was to make no profit? He quite admitted, of course, that this matter might be largely influenced by the Committee not making them the unpaid servants of Street.

The CHAIRMAN asked if the Corporation were prepared to make some arrangement of the kind referred to.

Mr. BALFOUR BROWNE: It does seem to me absolutely fair that our profits on gas should not be illimitable. On the other hand, I do not think Street should be put in a better position relatively to us than they would be in regard to the Gas Company. When a similar case was discussed in regard to Oldham, all that was argued for the outside authorities was: Let the Corporation of Oldham have the same profits as the Company would have had; and after that everything else is to go in reduction of price. I am perfectly willing to do that.

The CHAIRMAN remarked that the interest of the ratepayers in Glastonbury was not at all the same as the interest of the consumers of Street and Glastonbury.

Mr. BALFOUR BROWNE: The ratepayers in Glastonbury are responsible. If you give the ratepayers something for having stood the risk and racket, then I think there ought to be a reduction in price. I am willing to take 2 per cent. on the capital invested, to give me an interest and pay me for management.

The CHAIRMAN: If you were given the 2 per cent., their clauses would come into play.

Mr. BALFOUR BROWNE: No.

Mr. BONHAM CARTER: Having got the 2 per cent., you would have no objection to the surplus of the revenue being applied in reduction of the price?

Mr. BALFOUR BROWNE: No.

Mr. WEDDERBURN: But the other clauses would still remain open to the decision of the Committee.

Mr. FITZGERALD wished to point out what the position would be. Some of the Company's capital bore 7 per cent. and some 10 per cent. Glastonbury had to buy these dividends; and the result would be that the capital expenditure of Glastonbury would be very much more than the nominal capital of the Company, because a £10 share would be worth £27, £28, or £29. It was on this sum that Mr. Balfour Browne wanted 2 per cent.; and this would really be equivalent to giving him 5 or 6 per cent. for management, which would be very unfair. The precedent of 1 per cent. for management (not for expenses) would be very fair, because it would be 1 per cent. on the new capital expenditure, which would be from two-and-a-half to three times the nominal capital of the Company.

The room was then cleared while the Committee deliberated. On the re-admission of the public,

The CHAIRMAN said: We accept the clauses proposed by the petitioners, subject to clause 44 being left in its original form, and the proposed addition to clause 44 being altered to meet both cases of a sinking fund and payment by instalments; and subject to the clause relating to the keeping of accounts being amended to limit the inspection of accounts to once annually. The maximum price of gas will stand as in the Bill. The Committee decide that the Glastonbury Corporation be empowered to credit themselves with 1 per cent. on the capital employed from time to time—on the capital of the undertaking—as payment for management expenses.

The Committee then adjourned further consideration of the clauses, to enable the necessary further slight alterations to be made.

Thursday, March 29.

This morning the clauses of the Bill, as altered to conform to the decision of the Committee, were submitted and approved; and the Bill was ordered to be reported to the House.

LEGAL INTELLIGENCE.

The Promotion of the Automatic Gas-Meter Company.

In the Queen's Bench of the High Court of Justice last Tuesday, before Mr. Justice Mathew, the action brought by Mr. T. H. Sheen to recover £1125 in cash for services rendered and a similar amount in shares in the Automatic Gas-Meter (1895) Company, Limited, from Mr. John Haynes, of Liverpool, was mentioned. The proceedings were reported in the "JOURNAL" last week (p. 815), and resulted, it may be remembered, in judgment being given for the plaintiff, leaving the parties to settle between them the value of the shares. Mr. Dodd now said Mr. Sheen was prepared to accept the 13s. 4d. per share offered by Mr. Haynes; and final judgment was entered for the plaintiff for £1125 and for £750, the value of the shares.

The Powers of the Harrington Gas Company.

In the Chancery Division of the High Court of Justice on March 24, a petition by the above-named Company was presented to Mr. Justice Stirling, asking the sanction of the Court to certain alterations in the Memorandum of Association. Mr. J. S. Parkin, who appeared for the Company, said they carried on business at Harrington, in Cumberland, and they wished that the Memorandum might be altered—first, by defining more clearly the area over which the Company could exercise their rights and privileges; and secondly, by giving them larger powers, so as to enable them to deal with residual products, supply electricity and other illuminants, carry on business as mechanical engineers, supply gas stoves, engines, &c., and embark in any other undertaking which might seem to them to be capable of being profitably and conveniently carried on in connection with the above, or likely to enhance the value and profits of the concern. By the original Memorandum under which the Company was incorporated in 1866, the area of supply was the town of Harrington, otherwise called Harrington Harbour. It appeared that the parish of Harrington was more extensive than the town; and doubts had been raised as to the power of the Company to supply gas outside the town. Counsel read the resolution which had been duly passed and confirmed, embodying the amended Memorandum, which was to the effect indicated above, but couched in the most general and comprehensive language. He also read an affidavit by Mr. J. B. Tolson, the Secretary to the Company, in support of the petition. His Lordship said he saw nothing in the affidavit which justified his sanctioning the new Memorandum, so far as it gave the Company power to supply electricity for the purposes of light, heat, or motive power, nor did he think it was intended that the Court should confer such general powers as were included in the proposed Memorandum, which practically enabled the Company to do anything they pleased.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the half year ending Dec. 31, which, with the accounts for this period, will be presented at the meeting of the proprietors on Thursday:—

The Directors submit the accounts for the half year ended Dec. 31, 1899. The revenue account shows a net profit for the half year of £55,580 16s. 5d. This, added to the amount brought from the previous half year, makes £56,534 3s. 1d. Deducting therefrom £5679 17s. 9d. for interest, there remains standing to the credit of the net revenue account a balance of £50,854 5s. 4d. available for dividend. The Directors recommend that dividends be declared at the rates of 13½ per cent. per annum upon the old stock of the Company, and of 10½ per cent. per annum upon the new stock, both less income-tax; and that the difference between the declared dividends and the authorized amount divisible, having regard to the price charged for gas, be carried to the reserve fund. The balance of the net revenue will be carried forward to the next half year. To meet the requirements of the Company, further capital is necessary; and resolutions will be submitted to the proprietors to authorize the Directors to exercise the powers to raise additional capital conferred upon the Company by the Commercial Gas Act, 1875, by the creation and issue of £43,125 of new ordinary stock of the Company, and to authorize the Directors to dispose of the said stock, or any part thereof, in such manner, at such times, at such price, and on such terms and conditions as they may think fit. Also to authorize the Directors to exercise the powers to borrow the sum of £61,713 conferred upon the Company by the Commercial Gas Act, 1875, and the Ratcliff Gas Act, 1855, by the creation of additional perpetual debenture stock bearing interest at the rate of 4½ per cent. per annum, and to dispose thereof, or any part thereof, in such manner, at such times, at such price, and on such terms and conditions as they may think fit.

The accounts accompanying the report consist of the usual statements. They show that stock to the amount of £786,425 has been raised out of the total of £830,000 authorized; and that £238,287 has been borrowed out of £300,000 sanctioned. The receipts on capital account amount to £1,024,712 (issues of £1175 of new stock and £3167 of debenture stock having been made in the past half year); and there is £27,015 of premium capital—making together £1,051,727. The expenditure on capital account in the six months (£7921) comprised £2539 for new and additional mains, services, &c.; £3281 for meters and stoves; and £2101 for automatic meters and fittings, less £1961 written off for depreciation. The total expenditure to Dec. 31 last amounted to £1,054,330; so that the capital account had been overdrawn to the extent of £2603. The reserve fund at the above-named date stood at £42,093; and the insurance fund at £28,652. The balance-sheet shows that the value of the stores in hand at the close of the half year was as follows: Coals, oil, &c., £20,371; coke and breeze, £5619; tar, ammoniacal liquor, and sulphate of ammonia, £11,042; and sundries, £16,786—making a total of £53,818. On Dec. 31, 1898, the stores were valued at £51,351; the items being: Coals, oil, &c., £25,799; coke and breeze, £4389; tar, liquor, &c., £5146; sundries, £16,017. The revenue and profit and loss accounts, together with the statements relating to the manufacturing operations of the Company in the half year, are given below.

REVENUE ACCOUNT.

To Manufacture of gas—						
Coals and Oil, including dues, carriage, unloading and trimming			£86,953	12	0	
Salaries of Engineer and Officers at works			2,624	5	0	
Wages (carbonizing)			18,120	6	10	
Purification, including £3078 8s. 2d. for labour			7,204	1	11	
Repair and maintenance of works and plant, materials and labour (less £206 19s. 6d. received for old materials)			17,209	3	9	
					£132,111	9 6
Distribution of gas—						
Salaries and wages of Officers (including Rental Clerks)			£1,943	16	6	
Repair, maintenance, and renewal of mains and service-pipes, including labour			2,487	8	5	
Repair and renewal of meters			1,755	18	9	
,, ,, stoves			1,906	18	3	
,, Automatic meters and fittings			1,961	10	8	
					10,035	12 7
Public lamps—lighting and repairing					3,034	5 7
Rents, rates, and taxes					7,737	14 0
Management—						
Directors' allowance			£1,250	0	0	
Company's Auditors			75	0	0	
Salaries of Secretary, Accountant, and Clerks			1,324	19	8	
Collectors' salaries and commission			1,605	14	9	
Coin meter collection			423	18	10	
Stationery and printing			761	16	11	
General charges			544	15	11	
					5,986	6 1
Bad debts					674	16 3
Discount and allowances					1,066	0 4
Law and Parliamentary charges					317	18 9
Superannuation and allowances					210	9 6
Official Officers					167	8 2
					£161,342	0 9
Balance carried to net revenue account					55,580	16 5
					£216,922	17 2

By Sale of gas—						
Common gas, per meter, at 2s. 6d. per 1000 cubic feet			£151,401	5	1	
Public lighting and under contracts, common gas			9,918	14	5	
					£164,319	19 6
Rental—						
Meters			£2,500	7	1	
Stoves			1,928	8	3	
Automatic meters and fittings			3,223	3	2	
					7,651	18 6
Residual products—						
Coke, less £3548 3s. 9d. for labour			£27,779	9	10	
Breeze, less £550 4s. 5d. for do.			1,016	13	1	
Tar			9,333	14	11	
Ammoniacal liquor and sulphate of ammonia			6,569	16	9	
					44,720	14 7
Miscellaneous receipts—						
Rents receivable			£193	17	1	
Transfer fees			27	7	6	
					221	4 7
					£216,922	17 2

PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on debenture stock			£5,294	9	10	
Interest and dividend balance			385	7	11	
Balance available for dividend carried to balance sheet			50,854	5	4	
			£56,534	3	1	
Balance from last account			£50,428	19	2	
Less dividend for half year ended June 30, 1899			49,475	12	6	
			£953	6	8	
Balance from revenue account			55,580	16	5	
			£56,534	3	1	

STATEMENT OF GAS MADE, SOLD, &c.

Quantity Made. Meter Register (and estimated).	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Total Quantity accounted for.	Number of Public Lamps.
Thousands. 1,426,233	Thousands. 64,257	Thousands. 1,236,072	Thousands. 1,922,121	5,674

STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1899.	Received during the Half Year.	Carbonized during the Half Year.	Used and Sold in Half Year.	In Store, Dec. 31, 1899.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common coal	30,171	81,159	93,877	495	16,958
Cannel	7,666	Nil.	49*	639	6,977
	37,837	81,159	93,926	1,134	23,935

* Oil used for oil-gas manufacture, 1,507,119 gallons.

STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, June 30, 1899.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, Dec. 31, 1899.
Coke—tons	70	57,499	16,694	34,372	6,503
Breeze—tons	1,100	8,775	—	8,394	1,481
Tar—gallons	494,500	1,099,176	—	1,121,697	471,979
Ammoniacal liquor—butts	2,439	26,924	17,873	—	11,490
Sulphate of Ammonia—tons	200	542	—	339	403

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Report and Accounts.

At the Half-Yearly Meeting of the above-named Company last Saturday, the accounts presented showed that the revenue for the six months ending Dec. 31 last amounted to £156,138, while the expenditure came to £119,791, inclusive of £5993 for debenture interest; leaving a balance of £36,347 to be carried to the profit and loss account. Adding the £5079 brought forward, there was produced a sum of £41,426. The Directors recommended the payment of the usual dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares. This would absorb £33,567, and leave £7859 to be carried forward. The accounts further showed that £34,274 had been laid out for capital purposes; £21,314 being for manufacturing plant, £4745 for new mains and services, and £3022 for automatic cookers, fittings, &c. The total expenditure of capital up to the close of last year amounted to £1,006,067, as compared with £999,906 called up; showing an overdraft of £6161. The revenue from the sale of gas came to £119,590; the rental of meters and fittings, to £7600; and the sale of residuals produced £28,485. Gas manufacture cost £87,318 (coal figuring for £42,796, and cannel and oil for £17,968); distribution, £9665; and management, £4230. There were 77,163 tons of coal and cannel carbonized, and 784,002,000 cubic feet of gas made, of which 697,135,000 cubic feet were sold and 709,880,000 cubic feet accounted for. The estimated quantities of residuals were: Coke, 93,230 chaldrons; breeze, 6370 chaldrons; tar, 712,406 gallons; and ammoniacal liquor, 1,564,282 gallons.

BOARD OF TRADE REPORT ON GAS, ELECTRIC LIGHTING, AND WATER BILLS AND ORDERS OF THE PRESENT SESSION.

The Board of Trade report on the applications for Gas, Electric Lighting, and Water Bills and Provisional Orders for the present session was issued last Wednesday. It shows that the number of Bills relating to the supply of gas is 27, of which 26 relate to England and Wales and one to Scotland. The capital proposed to be raised is £4,585,686—£1,327,500 by shares and £3,258,186 by loans; the latter amount including £10,500 proposed to be authorized for gas expenditure by a Bill classed among the Electricity Bills, and £12,534 by a Water Bill. There are 14 Bills relating to the supply of electricity, two of them being for Ireland and the rest for England and Wales. In only nine cases is the proposed capital stated; but it amounts to £7,845,166—£5,840,000 by shares and £2,005,166 by loan. There are 47 Bills dealing with the supply of water, 42 of which are for England and Wales and 5 for Scotland. The total capital asked for is £23,979,347—£1,193,215 by shares and £22,786,132 by loans. Provisional Orders to the number of 21 have been applied for in respect of gas and water supply, and 108 in regard to electric lighting schemes, as compared with 20 and 109 last year. The capital proposed to be raised under these Orders is: Gas, £267,625; water, £370,000; gas and water, £34,375 (making a total of £672,000 for gas and water); and electric lighting, £1,791,241. Compared with last year, the capital required for gas purposes by Bills is £1,867,896 less, for electric lighting £1,720,166 more, and for water supply £14,303,820 less. For Gas and Water Orders, the capital proposed is £152,834 more, and for Electric Lighting Orders £2,203,060 less than in 1899.

NEW GAS-WORKS AT CROMER.

An interesting programme was provided for the shareholders of the Cromer Gas Company on the occasion of their annual general meeting last Thursday. In the first place, the Chairman (Mr. Benjamin Rust), under the guidance of the Engineer (Mr. Percy Griffith, Assoc.M.Inst.C.E.), conducted a party of about 40 gentlemen on a tour of inspection round the new gas-works, after which he opened a valve admitting the gas from these works to the town main for the first time, and amid much enthusiasm declared the works open. The company then adjourned to the Hotel Metropole, where an excellent lunch was provided by the Contractors, Messrs. R. Dempster and Sons, Limited, of Elland. After the usual toasts had been honoured, a further adjournment took place to the Town Hall, where the annual general meeting was held.

It may be remembered that in 1898 the Company applied to Parliament for a Bill giving them increased capital powers, and enabling them to extend their works. This Bill was opposed by the landowners, on the ground that the prominent position of the works was a serious check to the development of the town, and considerably depreciated the value of the land in this part of Cromer. This contention was so obviously correct, that the Directors of the Company at once opened negotiations with the landowners as to the terms upon which they would consent to remove the works to another part of the town where the same objection would not exist. The outcome of these negotiations was that the landowners agreed to give a new site containing 4 acres adjacent to the Midland and Great Northern Railway, and about a mile to the west of the Cromer Beach Station, together with a sum of £2000, and to allow the Company to continue in occupation of the existing works for a period of five years. Early last year, the Company let the contract for the construction of the new works to Messrs. R. Dempster and Sons; and the work was immediately put in hand. The works are now practically completed; and gas making commenced last week in time to allow of the opening ceremony on Thursday. The works form the first instalment of a scheme which, when fully carried out, will give a capacity of 2 million cubic feet per day, or half a million cubic feet per day per acre of ground occupied. As this has involved very liberal provision being made for extensions, a heavy initial outlay (about £20,000) has been incurred for the first section of the works, which has a capacity of about 150,000 cubic feet per day, or 30 millions per annum; and the capital of the Company will for a time be proportionately high, especially as the original 10 per cent. and 7 per cent. capital has at the same time been converted into 5 per cent. stock. But as the works are gradually enlarged, the capital expenditure on extensions will, of course, be much less than it otherwise would be; and the Directors are confident of very shortly being in a position to write off the capital represented by the old works, now about to be abandoned, without unduly sacrificing the interests of the shareholders for the time being. The Directors' report just issued recommended the payment of a dividend of 4 per cent. on the consolidated stock; and this will allow of £455 being carried forward, compared with £377 last year. The Engineer (Mr. Percy Griffith) stated at the meeting that he had carefully calculated the prospects as to dividend for the current year, and felt confident that, in spite of the sudden and heavy increase of capital involved by the cost of the new works having to be met during this year, the dividend would be maintained without any necessity of encroaching upon the reserve fund; and in each succeeding year the prospects would certainly improve proportionately to the increase in the sale of gas. This increase had been in the past year 22 per cent. on the sale of gas in 1898; and as an important extension of the mains to Overstrand is now being carried out, there is little doubt of this rate of increase being at least maintained, if not largely exceeded, nduring the current twelve months. The rapid development of the tow now taking place is a sufficient guarantee of the future growth of the gas undertaking.

The following is a brief description of the new works. The retort-house is 45 ft. long by 35 ft. wide, and is very lofty; provision having been made for stoking machinery being adopted as soon as the make of gas is sufficient to justify the capital outlay. It is furnished with four arches, each containing six retorts, which are estimated to produce 7500 cubic feet of gas per mouthpiece per day, and are set on Chester's system of regenerative firing, with all the most modern improvements in the way of fittings. The coal-store occupies the space between the retort-house and the railway siding, and is 50 ft. by 25 ft. in plan. Adjacent to the retort-house is a building including exhauster-house, with accommodation for four small exhausters or two large ones, boiler-house, with space for three boilers, workshop, store, weighbridge, stokers-room, large water, tar, and liquor tanks, with a well and pump for water supply. Underground storage is also provided for tar and liquor, with a pump to fill the overhead tanks, from which railway trucks can be loaded direct. The purifying plant comprises a Livesey washer and tower scrubber, also four purifiers, 12 feet square (for oxide), and two purifiers 10 feet square (for lime). The purifier-shed is a light and roomy structure, giving ample floor-space for revivifying the oxide, and includes a large meter-house at one end. The gasholder is constructed with Cutler's patent guide-framing, and is 60 feet diameter, with two lifts of 20 feet each; provision being made for a third lift being subsequently added, when the capacity will be 116,000 cubic feet. A handsome building provides residential accommodation for the Manager, a spacious governor-room, office, and photometer and board-room. Two cottages have also been erected on the works for the use of the stokers. Twelve-inch mains have been laid all over the works, and into the heart of the town.

PROPOSED ROYAL COMMISSION ON COAL SUPPLY.

A short time ago, Mr. A. D. Provand, the member for the Blackfriars and Hutchesontown District of Glasgow, asked the First Lord of the Treasury whether it would not be advisable to appoint another Royal Commission to inquire into the question of the coal supply. Mr. Balfour replied that he thought it would not, unless there were some practical issues to place before it. Mr. Provand has since addressed a letter to Mr. Balfour briefly calling his attention to some facts which have arisen since the last Commission reported, in 1871, on the output, export, and probable duration of the coal supply. He says:—

It is 29 years since the report of the Commission was issued; and some of their estimates and conclusions are already shown to be much astray. They estimated that our population in 1901 would be 35,000,000, while it will really be about 41,000 000; and they also estimated that our total consumption of coal in 1901 would be 162,400,000 tons, and the export 12,000,000 tons—making a total output of 174,400,000 tons. The foregoing figures are very different from the actual facts. Our output of coal in 1899 was 220,000,000 tons, of which the export was 41,000,000 tons. Of coal and cinders, there were exported about 2,000,000 tons; and the bunker coal for steamers' use was about 12,250,000 tons. Two years hence—that is to say, in 1901 (the year for which the Royal Commission made their estimate)—the production of coal will probably be several millions more than last year. Taking this at only 4,000,000 tons, the difference between their estimate and the actual output in 1901 will be as 174,000,000: 224,000,000; making a difference of 50,000,000 tons in excess of what the Royal Commission estimated. In 1879, the export (not reckoning bunker coal, coke, or cinders) was 10,300,000 tons. The Royal Commission did not expect that it would ever exceed 13,000,000 tons, on the ground that the development of coal in North America, India, China, and other countries, would check it. But our export is already 41,000,000 tons—about 3¼ times what the Royal Commission estimated; and it is steadily increasing year by year.

In regard to the probable duration of our coal supply, the Royal Commission dealt with three estimates—(*a*) according to Professor Jevons, showing that it would probably last about 110 years; (*b*) another one by Mr. Price Williams, estimating 360 years; and (*c*) by the Commissioners themselves, taking 276 years as the probable duration. Mr. Geddes, who reported on the Scottish coalfields, considered 12,000,000 tons, which was the total output in 1866, as likely to represent the future annual output in Scotland; and he based on this the assumption that our supply in Scotland would last for 820 years. But the output in Scotland is now 35,000,000 tons—nearly three times Mr. Geddes' estimate; and it is annually increasing. Within the last few years, several fresh estimates have been made, more particularly directed to the question of how long our coal supply would be commercially valuable. Fifty years have been stated by competent experienced engineers as the probable period when the principal seams will be exhausted; but in certain parts of the country a much shorter estimate than this has been arrived at. For example, in a paper read before the Philosophical Society of Glasgow in 1893, on the "Recent Developments of the Hamilton Coalfields," by Mr. R. T. Moore, mining engineer, Glasgow, he stated that at the then output of 11,000,000 tons per annum the field would last only 24 years. This opinion he confirms by a letter to myself a few days ago. The time is therefore now only 17 years until the cheaply-worked coal of Lanarkshire, by which Glasgow and its industries have been largely created, will come to an end. The manufacturing population of Glasgow and the neighbourhood supplied by Lanarkshire coal is more than one-fourth of the whole population of Scotland. No doubt, after the exhaustion of these cheaper coals, there are others obtainable from a greater depth, and Ayrshire and the East of Scotland will be able to supply Lanarkshire; but it will be at a considerably increased cost, and must therefore materially affect manufacturing industries. The extreme possible duration of our coalfields is a matter of little practical value. The question of importance is to ascertain for how long, having regard to our output, to our export, to the increasing cost with us, and to the output and cheapness in other countries, we shall be in a position to compete as hitherto in those industries requiring the consumption of considerable quantities of coal.

There are other facts besides those above referred to which ought to be considered. For example, we have in Wales the most valuable steam coal for naval use in Europe. Of this the supply is limited. It is an important arm of defence; but it will not remain so permanently unless we reserve it for our own use. This is a question for a Royal Commission. Another point which was absent from the minds of the Royal Commissioners in 1871 was the coal development of the United States. This is rapidly increasing, and will probably equal or excel our own output within a few years. This increase of output has been accompanied by a declining price until the average cost at the pit is lower than in this country. The recent rise in price with us will probably not be maintained; but few expect that it will go back to the figure of a year ago.

There are other matters to which I might draw attention; but I believe I have said enough to show the necessity for the appointment of a new Royal Commission, in regard to which I suggest that the terms of reference be wider than those to the former Commission. I append a copy of

these to show that what our commercial competitors were doing was thought so little of that it was not even referred to. The case is now very different. There are many new factors to be considered, not only in regard to our own output, export, and the duration of our coal supply, but also in regard to the same matters in other countries.

The following are the terms of reference to the Royal Commission of 1871: To investigate the probable quantity of coal contained in the coal-fields of the United Kingdom, and to report on the quantity of such coal which may be reasonably expected to be available for use. Whether it is probable that coal exists at workable depth under the permian, new red sandstone, and other superincumbent strata. To inquire as to the quantities of coal at present consumed in the various branches of manufacture, for steam navigation, and for domestic purposes, as well as the quantity exported, and how far, and to what extent, such consumption and export may be expected to increase. And whether there is reason to believe that coal is wasted by bad working, by carelessness, or by neglect of proper appliances for its economical consumption.

THE NEW GAS-WORKS AT PERTH.

Resignation of the Manager—Contractor to be Sued.

A Special Meeting of the Perth Gas Commissioners was held on Monday, the 26th ult., to consider and dispose of a resolution of the Commissioners in Committee to accept the resignation of the Gas Manager. Lord Provost MACGREGOR, who presided, called on the Clerk to read the minute of the meeting held in Committee on the 19th ult.

The minute was read as follows: "Lord Provost Macgregor stated the Clerk had received a communication from Mr. Wilson, Gas Manager, which he desired the Clerk to read. The Clerk thereupon read a letter of this date (19th) from Mr. Wilson resigning his appointment as Gas Manager to the Commissioners. Agreed, on the motion of Councillor Watson, seconded by Lord Provost Macgregor, that the resignation be accepted, and the Clerk be instructed to write Mr. Wilson accordingly."

Mr. WATSON formally moved that they accept Mr. Wilson's resignation in the terms indicated in the minute.

The LORD PROVOST seconded.

Mr. M'VICAR said that if he was in order, he wished to enter his dissent.

The motion was unanimously agreed to with one dissentient.

The meeting next had under consideration the resolution of the Commissioners in Committee on the 19th ult. to adopt legal proceedings against the Contractors in reference to the defective wall at the new gas-works. The minute of meeting was read by the Clerk as follows: "Read memorial to Counsel as to Commissioners' legal position with reference to defective condition of wall at new gas-works, and their remedy, and against whom, with the queries attached, and Counsel's opinion thereon; also read a letter of date 27th ult. [February] written by the Clerk to each of the Gas-Works Engineer and Inspector of Works, and the replies to each of their letters. After due consideration, the meeting agreed, on the motion of Councillor Watson, seconded by Councillor Chalmers, that an action of damages and for payment should be raised by the Commissioners against Messrs. Symington and Son, the Contractors for the wall. Remit to a Committee consisting of the Lord Provost, Councillors Brand, Chalmers, Ritchie, and Watson, to have the necessary steps taken for the institution of this action and with power to obtain the evidence of two skilled men as independent witnesses."

Mr. WATSON moved approval of this minute, and that they take up the case against Messrs. Symington and Son as far as regards the defective work at the new gas-works. This had occupied their attention for some considerable time; and they had been reluctantly compelled, in their own interest, as well as in the interest of all corporate bodies, to see that a case of this kind should not be allowed to pass. The work had been found to be very defective in many respects, both in quantity and quality. Some of the work had not been done at all, and had been charged for; and in many other respects it was very deficient. Consequently, as the amounts charged for this work had been overpaid, it was desirable that they should get to the bottom of it, and to demand a remedy. They had consulted Counsel, and were assured that they had a good case; and he thought it desirable the Commission should see the case through.

Lord Provost MACGREGOR seconded the motion. It was impossible, he said, that they should allow such a grave matter as this to pass without getting redress; and this was the only manner evidently in which they could obtain the satisfaction to which the Commission were entitled. They would not enter into the question at large. It was simply a glaring fact that this extraordinary work they were asked to take as good and sound work was found to be so defective and so unsatisfactory that it was impossible to pass it as it was.

Mr. M'VICAR said he would make the same suggestion as he made in Committee—that this question of raising an action against the Contractors should be reconsidered in Committee. If his suggestion was not agreed to, he would move an amendment. His reason was that if they talked over the matter again, perhaps an action might be raised against others.

The LORD PROVOST: I think you should be satisfied with the Committee appointed to deal with the matter.

Mr. RITCHIE said the reason why they had not entered into certain details that night, so far as they dealt with the question, was not any desire to keep the public from knowing, because it would be known in due time, but that it was desirable that the matters should not be known too soon.

Mr. M'VICAR: I move, as an amendment, that we raise an action, not only against the Contractors, but also the other parties implicated in this question—viz., Mr. Wilson and Mr. Wynn.

The CLERK (Mr. Begg) said this had been under discussion with Mr. Watson and himself, and Mr. M'Vicar and himself; and he stated that Mr. Watson objected to Mr. Wilson and Mr. Wynn being spoken of in this matter, and being included in any amendment to the resolution agreed to the previous Monday. He advised Mr. M'Vicar to move disapproval of the resolution and to remit the matter back to the Commission in Committee to consider whether any action should be taken against the Manager, along with the Contractors. That he thought would be a competent amendment.

Mr. HARDIE seconded the amendment.

A vote was taken, with the result that 23 voted for the motion and 2 for the amendment. The motion thus became the finding of the meeting.

The "Perthshire Constitutional," in its issue of last Wednesday, contained the following editorial comment upon the meeting: "It was well that the Gas Commissioners of Perth kept their mouths sealed on Monday night when they agreed first of all to accept the resignation of the Gas Manager, and also take steps to receive from the Contractor for the wall which is alleged to be defective, that redress to which the Commissioners claim to be entitled. At one stage of the meeting it appeared as though the Commissioners would break through their resolve to say no more than was judicious; but, fortunately, better sense gained the day, and nothing out of place was said, though it was quite apparent that feelings were strong. To have entered into the merits of the case on Monday would simply have led to the washing of dirty linen before the public; and to have indulged in such an objectionable practice would not have been dignified, nor would it have been wise under the circumstances. If the case be as bad as it is hinted to be, the Commissioners acted wisely in taking steps to have it cleared up in the manner agreed upon."

GERMAN CONTINENTAL GAS COMPANY.

Report and Accounts for 1899.

We have received, as in past years, a copy of the annual report and balance-sheet submitted, on the 30th ult., to the forty-fifth general meeting of the above-named Company, of which Dr. W. von Oechelhaeuser is the Managing-Director. We extract the following particulars.

The general expansion of trade which prevailed during 1899, no less than during 1898, was reflected in the business of the Company by an increase in the annual production of gas of 7·87 per cent. This was attended by an increase of 68,258 in the number of burners in use, indicating the marked progress of the Company's business, since in the early years of the present decade the annual increase was not more than one fourth that number. Of the new burners installed for lighting purposes, 91·64 per cent. were of the incandescent type, 7·95 per cent. were flat flame, and only 0·41 per cent. argand. Such figures clearly show that the incandescent system now constitutes the normal method of using gas for lighting; and this fact must be recognized when comparisons of the cost of lighting by gas and other illuminating agents are made. The Company's statistics prove that only the incandescent burner now has to be taken into account in gas lighting; and the advances in its manufacture which are continually taking place constantly increase its efficiency, and place gas in a still better position to compete with other means of illumination. Prepayment meters have been responsible for a considerable part of the increased sales of gas during the year. The number in use rose from 4652 at the close of 1898, to 8092 at the end of 1899. They are now giving great satisfaction; and the number of failures is no greater than would occur with the same number of ordinary meters.

At the Erfurt works of the Company, a water-gas installation commenced work only late in the autumn; and the results of its adoption have not been felt in the year's accounts. The advantages to be derived from this method of producing gas have, however, already been realized, in the ease with which the make can be quickly increased or diminished by its aid. The water gas at Erfurt is carburetted by means of benzol. The rise in the price of coal which has been witnessed during the year favours the spread of the water-gas process. The Company have been able, however, under their contracts to secure nearly the whole of the coal required during the year at the prices which prevailed before the recent rise; and fortunately the term of these favourable contracts does not expire until April 1, 1901.

The total gas production in the year amounted to 53,111,605 cubic metres (1,875,721,309 cubic feet). Of this quantity, 19·99 per cent. was sold for heating, cooking, and power purposes; while the unaccounted-for gas, which in 1898 had risen to 4·42 per cent., fell to 4·09 per cent. of the total make. The average consumption per burner fell, however, from 3313 to 3164 cubic feet. The number of burners in use at the close of the year was 595,859. The length of mains served by the Company considerably increased. Of gas-engines, 967, affording 5133¼-horse power, were supplied. The carbonizing returns show that the make per ton of coal increased from 10,847 cubic feet in 1898 to 10,869 cubic feet last year; while the coke used for firing the retorts dropped from 16·78 to 16·72 per cent. of the weight of coal carbonized. The output of the Company's electricity supply works at Dessau increased by 36 per cent. The gas-engines used at these works showed a greatly improved duty; the consumption of gas during the past year averaging only 17·58 cubic feet per effective horse-power-hour.

A new contract has been made for the supply of gas to Jonitz, a suburb of Dessau, until the end of the year 1925.

The report contains obituary notices of Herren W. Conrad and F. A. Neubauer, who had served as Directors for 37 and 32 years respectively.

The gross profit for 1899 amounted to 4,030,907·24 marks (about £196,630), and the net profit to 3,208,849·13 marks (about £156,530). After the customary contributions have been made to the reserve and contingency funds, the balance admits of the payment of a dividend of 13⅓ per cent. for the year. The dividend for 1898 was at the rate of 12⅔ per cent., and that for 1897 only 11 per cent. The balance carried forward to this year's account is 29,028·47 marks (about £1416). The finances of the Company consequently are at the present time in a highly satisfactory position.

Twelve towns or districts are now served by the Company. Among these, the more important are Frankfurt-on-Oder, Potsdam, Dessau, Warsaw, Erfurt, Nordhausen, Gotha, and Ruhrort. In most cases, numerous suburbs and outlying townships are also furnished with the Company's gas.

The Water Committee of the Liverpool Corporation have ordered the Water Engineer to prepare plans and specifications for the construction of an additional filter-bed at Chorley. They have also agreed to recommend the purchase from the Earl of Derby of 32 acres of land at Prescot, at £120 per acre, for the construction of additional storage works.

COLONIAL GAS UNDERTAKINGS.

In the "JOURNAL" for the 13th ult., we gave a report of the proceedings at the half-yearly general meeting of the Australian Gaslight Company, at which the accounts for the six months ending Dec. 31 were presented. The accounts of other Colonial gas undertakings have recently come to hand, from which the following particulars are extracted.

The Brisbane Gas Company had in the six months ending Dec. 31 last a revenue from the sale of gas, &c., of £21,693; and the balance of £2348 brought forward made a total of £24,041. The expenditure on manufacture, allowance for depreciation, &c., came to £12,382; £1000 was placed to the reserve; £432 was paid for interest; and there was left a balance of £10,227. The Directors recommended a dividend of 5 per cent., which, with the tax (£347), amounted to £7345; leaving £2882 to be carried forward. It is satisfactory to find that the Company's mains are being extended in many localities, and that there is a steady increase in the output of gas.

The profit realized by the Maryborough (Queensland) Gas Company, Limited, in the half year ending Dec. 31, with the balance brought forward, was £1047. After deduction of the dividend tax (£38), there was left £1009 to the credit of the profit and loss account. The Directors recommended that £771 of this sum should be used in paying a dividend for the six months at the rate of 6 per cent. per annum; and that the balance of £238 should be carried forward.

The North Shore (Sydney) Gas Company made a net profit of £3049 on the sale of gas in the second half of last year. Adding the balance brought forward (£59), there was a sum of £3108 available for distribution at the ordinary general meeting on the 29th of January. Out of this, the Directors recommended the following appropriations: A dividend of 3 per cent. for the six months, free of income-tax, £2844; payment to the officers' fidelity guarantee fund, £200; interest suspense account, £10—total, £3054. This would leave a balance of £53 to be carried forward. The recommendation was agreed to.

At the half-yearly meeting of the Rockhampton (Queensland) Gas Company on the 26th of February, the Directors reported that the result of the operations in the six months ending Dec. 31 had, on the whole, been satisfactory. The demand for gas was largely on the increase, and the general consumption was assuming the proportions of former and more prosperous years. The gas operations resulted in a profit of £2225; but the Company's electrical undertaking entailed a loss of £149. After providing for interest on debentures, &c., and dividend duty, the profit and loss account showed a credit of £1551. As this was not quite sufficient for the usual dividend, the Directors recommended appropriating £133 from the reserve, and paying a dividend at the rate of 7 per cent. per annum upon the ordinary shares, and of 9 per cent. per annum upon the preference shares, free of duty. This was sanctioned.

The revenue from the sale of gas, coke, tar, &c., by the Wellington (N.Z.) Gas Company last year amounted to £36,764. As there was a balance of £3889 brought forward, there was a total of £40,653 to meet the expenditure and the dividend. The former included £16,187 for coal, wages, purifying, renewals, &c.; £2844 for interest; a sum of £2000 was written off plant; and taxes, Directors' fees, salaries, &c., came to £3856. The interim dividend paid in July last took £5000; and there was left a balance of £10,518 on the profit and loss account. The Directors reported a satisfactory increase in the Company's business; and they recommended the payment of a dividend of 10s. per share on the fully-paid shares, and of 5s. per share on those partly paid up—being similar amounts to those paid in July.

ANGLO-ROMANO GAS COMPANY.

The report read at the last meeting of this Company furnished the following details: The quantity of gas sold was 14,644,171 cubic metres (about 517 million cubic feet), 4,024,552 cubic metres of which went to the Municipality, and 10,619,619 cubic metres to private consumers; the increase, as compared with the previous financial period, being 594,691 cubic metres for private consumers. This augmentation, due to reduced rates and other concessions, is the more deserving of note as many consumers have adopted electric lighting, which has also become cheaper. There was an increase of 2100 metric tons in the amount of coal carbonized, with a corresponding improvement in the sale of bye-products, for which better prices were obtained, but not sufficient to compensate for the dearness of coal, which was, on an average, 2 lire more per ton than before. The mains were increased by 3996 metres (4395 yards), and the total length is now 206,350 metres (226,985 yards). There were also laid on 160 rising pipes, bringing up the total to 482. Interior fittings to the number of 813 were put in, making a total of 3430, of which 2766 are in operation. Fittings with prepayment meters attached were also increased. A sum of 237,496·64 lire was expended on this work during the year. On Dec. 31 last, there were 8300 public-lamp burners, 7609 of which were in use; being an increase of 139 as compared with the number at the corresponding date in 1898. There were also 15,295 meters of all kinds employed by private consumers, representing 122,286 burners—an increase of 1110 meters and 4012 burners as compared with 1898. In electric lighting, there was an augmentation, as in gas, though in greater proportions. Last year the consumption was 17,854,017 hectowatts—an increase of 2,441,878 hectowatts as compared with 1898. Besides this, 4,479,272 hectowatts were sold for motive power, or 4,408,022 hectowatts more than in the preceding year. Lastly, 24,174,933 hectowatts were supplied to the Tram and Omnibus Company more than in 1898. This enormous increase, due to new lines, greatly helped to compensate for reduced rates. The profits last year were 1,195,125 lire, making, with the 3079 lire brought forward, a total of 1,198,204 lire available for distribution according to the Company's statutes, as follows: To the shareholders, 5 per cent. on the capital, 700,000 lire, and 85 per cent. of the remainder, 420,000 lire; 10 per cent. to the reserve fund, 49,420 lire; 1 per cent. to the Manager, 4942 lire; 4 per cent. to the Vigilance Committee, 19,768 lire; and to the inspectors, 2000 lire. These amounts totalled up to 1,196,130 lire; leaving to be carried forward to the new account 2074 lire. As in October last the shareholders received 420,000 lire as interim dividend, the coupon payable on the 15th inst. will be 25 lire per share.

THE POWERS OF THE MASSACHUSETTS GAS COMMISSIONERS.

The Price of Gas at Haverhill.

We learn from the "American Gaslight Journal" that interest in the question of the price of gas at Haverhill (Mass.), which, it may be remembered, was ordered by the Board of Gas and Electric Light Commissioners of that State to be reduced from $1 to 80 c. per 1000 cubic feet as from the 1st of February last (see *ante*, p. 417), continues unabated; and it is now expected that the decision of the United States Circuit Court will be given early in the present month. The bill of complaint filed by the Company is a voluminous document, which contains many specific statements regarding the entire controversy which has arisen since it was started last year for lower rates. The bill was to be returned on the 2nd inst.; and in it the Company recite that the actual cost of gas production, including the amount allowed for depreciation and a fair return for money invested, is 91 c. per 1000 cubic feet. They also state that the price of $1 per 1000 feet would never have been made if it had been known that the cost of materials would increase as it has done. The Company also contend that at the present time $1·10 would be a fair charge for gas at Haverhill. When interviewed early last month at the Massachusetts State House, the Commissioners said they had no remarks to make regarding the action of the Company in refusing to abide by their order for 80 c. gas; and it has been rumoured that the Commission intend notwithstanding to take steps to enforce it. Nothing will, however, be done until the matter has been settled in the Courts.

Referring to the above, our contemporary's correspondent "Observer" says: "As predicted, the Haverhill Gas Company decided to contest the legality of the order of the Board of Gas and Electric Light Commissioners requiring them to furnish gas at 80 c. per 1000 cubic feet, and a petition was filed in the United States Circuit Court on the 1st of March to restrain the Commissioners from enforcing their order. The bills are being sent out at $1 per 1000 feet; and a good 25-candle water gas is being distributed. It is not believed, however, that furnishing good gas and good service, or proving to the Court that gas cannot be made and sold at a profit in Haverhill at 80 c. per 1000 feet, will suffice to allay the disturbance. The discontent appears to be based upon the belief of both the public and the Commission that the Haverhill Gas Securities Company intend, in one way or another, ultimately to make the people of Haverhill pay interest on $1,000,000, while the actual capital invested and accumulated does not amount to over $400,000. Until some assurance is given to the Haverhill people that the fixed charge due to capital shall be a reasonable one, it is not believed that any satisfactory peace can be assured, and further conflict will only make the matter worse. The mistake of over-capitalization, and extreme reduction by the Commission of the selling price to a point below cost, at existing prices of materials, have wrought havoc among the gas companies of the State, and they are prayerfully asking that no further mistakes shall be made. Some form of action looking towards lower prices is being taken in practically every large city in the State, and in many of the towns."

INSPECTION OF GAS AND METERS IN MASSACHUSETTS.

Calorimetric Tests of Gas.

We have received the annual report of the Inspector of Gas and Meters in Massachusetts (Mr. Charles D. Jenkins). It shows that in the year ending Dec. 31 last, there were 687 gas inspections made, 30,445 gas-meters examined, 5 meter-provers graduated, and a number of gas analyses carried out, in addition to the regular office work. The gas supplied by the big companies in the State was tested at regular intervals by Mr. Jenkins or his assistant without notice; and the results were furnished to the Board of Gas and Electric Light Commissioners from time to time during the year. The average illuminating power of the coal gas, supplied by 36 companies, was 18·23 candles, as compared with 18·43 candles in 1898; of the water gas, supplied by 16 companies, 23·88 candles, against 23·72 candles; of the gas sent out by the ten mixed coal and water gas companies, 20 22 candles, against 20·21 candles; and of the petroleum oil gas supplied by 7 companies, 40·97 candles, against 38·02 candles. The average quantity of sulphur found in the gas of all the companies except those supplying oil gas was 10·57 grains per 100 cubic feet, against 9·61 grains in 1898; the ammonia averaging 2·52 grains, against 2·06 grains. There were 64 violations of the law last year—rather more than usual. Eudiometric analyses of the gases were made for various reasons, and the results are recorded in a table from which the following figures have been extracted:—

Company.	Candle-Power of Gas.	Specific Gravity.	Illumi-nants.	B.T.U. Calculated.
Cambridge	16·9	..	4·07	602·0
,,	17·0	..	5·60	629·0
Chicopee	22·2	..	12·61	633·0
Jamaica Plain	13·4	..	3·83	..
Fitchburg	14·5	·397	3·81	..
Attleborough	14·8	..	4·83	..
Jamaica Plain	18·9	·507	5·75	724·9
,, ,,	17·4	·501	5·92	676·4
Boston	27·1	..	14·83	691·2
,,	27·0	..	16·13	714·3
,,	26·2	..	14·33	684·9
,,	25·0	..	14·07	689·4
,,	23·3	·582	13·07	659·4
,,	26·2	..	13·43	661·4
,,	23·9	..	13·09	661·6
Brookline	25·0	..	13·61	654·1
,,	26·6	..	13·36	655·3
,,	26·9	..	12·49	629·2
,,	24·5	..	14·20	674·4
,,	26·8	..	14·93	706·1
,,	24·4	..	13·43	679·7
,,	23·0	·524	8·88	647·6

The first two analyses are of gas of low candle power; the third is an

analysis of medium candle-power gas; the next three relate to coal gas below the standard; the next two are of Jamaica Plain gas after being taken from the Massachusetts Pipe-Line Gas Company. The remaining analyses were made in response to the request of the Board of Gas and Electric Light Commissioners. In the table, the calorific powers are calculated for gas at 60° Fahr. and 30 inches of the barometer, and include the latent heat of the steam formed. The heat-units, on this account, will be from 35 to 50 B.T.U. higher than the usual "net" units.

Mr. Jenkins points out that more attention should be paid to burners, both for lighting and heating, in order to develop the best results from the gas used, and at the same time not to waste it. The burner tested gave, on proper regulation, 23·1-candle power when burning 5 feet of gas; but by simply opening the cock and supplying more gas, an illuminating power of only 21·2 candles was developed, although 10·2 cubic feet were being consumed. By using burners of this sort, the amount of gas burnt would be more than twice as much as in the first case, and the light actually obtained upwards of 8 per cent. less.

With regard to gas-meters, during the past year there were 30,445 inspected; 29,960 were new ones, or those which had just been repaired, and were examined and sealed, if correct, before being used. Very few required adjustment before passing inspection. The remaining 485 meters belong to the class of "complaints." By the provisions of section 12, cap. 61, Public Statutes, "meters in use shall be tested by the Inspector or by his assistant or deputy on the request of the consumer or of the gaslight company." Meters so tested are called "complaints;" and the results of these tests follow. One meter would neither pass gas nor register; while 11 meters would pass gas, but not register. The average error of the remaining 473 meters was 0·64 per cent. fast. The law allows a meter to be stamped as correct that does not vary more than 2 per cent. either way from the standard measure. There were 199 meters—41·04 per cent. of the total number re-inspected—which were fast, the average error being 4·64 per cent.; 49 meters, 10·10 per cent. of the total, slow, the average error being 13·52 per cent.; and 225 meters correct within the legal limits. Of the fast meters, 118 were between 2 and 5 per cent., 73 between 5 and 10 per cent., 7 between 10 and 15 per cent., and 1 between 15 and 20 per cent. Of the slow meters, 19 were between 2 and 5 per cent., 17 between 5 and 10 per cent., 5 between 10 and 15 per cent., and 1 between 15 and 20 per cent.; and there was 1 each 20, 25, 30, 35, 60, 105, and 160 per cent. slow.

ACETYLENE LIGHTING IN FRANCE AND BELGIUM.

Recent French publications have furnished particulars of the progress of the Urban Acetylene Lighting Company, gathered from the report lately issued on the working of the undertaking from its formation on May 25, 1898, to Dec. 31 last. The capital is 2,000,000 frs. (£80,000), in 20,000 shares of 100 frs. each; and it has all been paid up. There are 4000 founders' shares, which entitle holders to 50 per cent. of the profits as soon as these allow of the payment of a dividend of 10 per cent., or 10 frs. per share. In the period under notice, the Company have been able to clear off more than 10 per cent. of the preliminary expenses, which amounted to 668,874 frs., and pay a dividend of 15·83 frs. per share; representing practically 10 per cent. per annum. The Company have acquired, and are working the Turr patent, which was briefly described in the "Journal" for Feb. 16, 1897. The special features of the system are claimed to be the absence of movable parts and the use of a generator which furnishes increased guarantees of safety. Without entering into the merits of the system, it may be mentioned that the Company obtained the gold medal—the highest award—at the Acetylene Congress at Buda Pesth last year for their plant. They attribute their success to the fact that the system allows of the utilization of acetylene not simply alone, as a naked flame, but in conjunction with some incandescing material, such as a mantle, whereby the light of 10 candles is produced, it is stated, at the very low cost of 0·5 c. per hour. In Paris, the Company have obtained the contract for lighting the Rue des Archives, the Passage St. Pierre-Amelot (near the Place de la Republique), and the hundred pontoons of the Bateaux Parisiens along the Seine, from the Pont National to the Point du Jour—the entire length of the city. The object for which the Company was formed, however, is the lighting of places considered to be too small to justify the establishment of gas or electricity works; but they have succeeded in practically applying their system at Mouzon (Ardennes) and La Clayette (Saône-et-Loire)—towns of 1200 inhabitants. Contracts and negotiations are now being made with 150 communes for concessions of twenty to forty years. The Company are now completing plant for lighting the town of Courneuve, near Paris, for which they have secured the concession for forty years. In Belgium and the Grand Duchy of Luxembourg, they have, among other installations, lighted the railway stations of Yvoir and Seraing; and in Luxembourg itself, arrangements for illuminating the Hollerick Station are being completed.

ELECTRIC LIGHTING NOTES.

The Local Government Board have sanctioned the borrowing by the Hanley Town Council of £5019 for electric lighting purposes, repayable in 25 years.

A report submitted to the Exeter Town Council last week showed that the adverse balance on the electric lighting accounts had been reduced to £581, which is £685 less than at the beginning of last year. The income for the twelve months was £6202, and the expenditure amounted to £5517.

The Watch Committee of the Newcastle Corporation have resolved to make immediate application to the Local Government Board for permission to borrow £10,000 for the purpose of fitting up the electric light in those streets through which the tram-lines run. The annual cost will, it is expected, be somewhat more than at present.

During the past year, the Dover Electricity Supply Company had an increase to the extent of 20 per cent. in their output, as compared with 1898. The gross profit amounted to £2739. After paying debentures and other interest charges, there remained £1325, out of which the Directors recommended the payment of a dividend at the rate of 3 per cent. This would absorb £1313; the balance being carried to the credit of suspense account. At the recent annual meeting, a resolution was passed empowering the Company to raise £25,000 of additional capital, in 5 per cent. preference shares, although it is only proposed to put a few of them on the market this year.

Last Wednesday, Mr. E. A. Sandford Fawcett held an inquiry, on behalf of the Local Government Board, relative to an application by the Rotherham Corporation to borrow a sum of £27,969 for electric lighting purposes. The Borough Comptroller (Mr. J. G. Thurgarland) stated that the Corporation had received numerous inquiries as to the supply of electric light in the borough, and felt that the time had arrived when they should take steps to provide it. In the year 1898, they obtained their Electric Lighting Order, and shortly afterwards called in Professor Kennedy to advise them as to carrying out a scheme. His report, which was received in January last year, was adopted by the Council; and it was also decided to appoint him Engineer. The land proposed to be utilized for the station was purchased by the Corporation in 1896, and was intended for extensions of the gas-works. Contracts to the amount of £15,138 had been entered into in connection with the scheme. In answer to questions, Mr. Thurgarland said the whole site comprised 22,110 yards, and the amount paid was £2664. The Corporation had also spent £305 on road-making; bringing up the total to £2969. Mr. B. Jenkin (Professor Kennedy's partner) said the system of generation was the three-wire continuous one—230 volts. The pressure on the mains would be 460 volts. There would be about 35 ordinary 10-ampère arc lamps for public lighting, which number would practically cover the area of the mains. With regard to private lamps, the plant would be 10,000 wired and 5000 alight of 8-candle power. The extent of the mains would be about 5000 yards. Four engines would be fixed—viz., two of 50-horse power each, and two of 150-horse power apiece. The dynamos would be six in number. The two large ones would have a capacity of 90 kilowatts; and there would be four balancing dynamos, each of 14½ kilowatts. The total capacity of the generating station would be slightly over 200 kilowatts. It was estimated that the energy would be about 105,000 units per annum in about two years. Two storage batteries, with a capacity of 250 ampère-hours each, would be provided. The Mayor (Mr. G. Gummer) said the routes which would be covered by the cables included all the important buildings in the town as well as the premises of the most prominent tradesmen. He had reason to believe the introduction of electric lighting would be a financial success.

THE FALMOUTH CORPORATION AND THE WATER-WORKS.

There was another discussion on the question of the water supply at the meeting of the Falmouth Corporation last Thursday. The Water Committee reported that they had had a conference with Mr. Amos, the Chairman, and Mr. Cox, the Manager, of the Falmouth Water Company, and as the result these gentlemen had promised to lay before the Directors the questions—referred to in the recent report of Dr. Buchanan, one of the Medical Inspectors of the Local Government Board—of giving the town a constant supply of water, large new mains through the principal streets, fixing valves for shutting off the water in separate districts, and the periodical analysis of the water. The Mayor (Alderman Bowles) said the Committee had a very friendly and businesslike talk with Mr. Amos, and the matter would be at once laid before the Directors of the Company. Mr. T. G. Mead said they pressed Mr. Amos for his views on the question of the purchase of the undertaking by the Corporation; but they had no definite answer. A resolution was passed directing the Committee to put a series of questions to the Company. These asked whether the Company were prepared to double the capacity of the reservoir pool, convert the high-level reservoir into an exclusive service reservoir, make bye-laws for the rigid supervision of the watershed, construct new and enlarged filter-beds in place of the existing ones, and cleanse and scrape the whole of the mains—supplying new ones where necessary. Mr. Mead thought that, after the friendly discussion they had had with Mr. Amos, such questions would be most inopportune. Some of the suggestions were impracticable. The Mayor said that at present the filter-beds were being enlarged. Mr. J. W. Buckley said the majority of the members wished the water-works to become the property of the Corporation; but the questions suggested would not promote an amicable settlement. If they were going to purchase, the sooner they set to work the better; and they could carry out the necessary improvements themselves. The Company wished to know what the Corporation were prepared to give. It was decided to postpone consideration of Mr. Grose's questions until the reply of the Directors is received.

TONBRIDGE DISTRICT COUNCIL AND THE WATER-WORKS.

Board of Trade Inquiry.

At the Central Hall, Tonbridge, on the 22nd ult., Mr. Ingram B. Walker held an inquiry, on behalf of the Board of Trade, into the terms of the Provisional Order applied for by the Tonbridge Water Company to enable them to enlarge their existing works, reservoirs, and limits of supply, increase their capital, and purchase additional land for the purpose of extending their gathering-ground.

Mr. Reader Harris, Q.C., conducted the case for the Company; Mr. W. P. G. Boxall opposed the application on behalf of the Urban District Council.

Mr. Reader Harris, said the Water Company was formed as far back as 1852, was registered as a joint-stock undertaking in 1856, and had since been incorporated under the Acts of 1862 and 1867. In 1885, the Tonbridge Local Board approached the Company with a view to purchasing the concern; but the Directors declined to accede to the request. As a consequence, the Local Board having made allegations as to the quality of the water and the sufficiency of the storage, the Directors considered it advisable to apply for a Provisional Order for further powers and additional capital. At the inquiry, the application was strongly opposed by the Local Board; and, as the result, a clause was inserted in the Order giving them the option to purchase the works, at £19,750, in the course of three years. But they never exercised it, as there was considerable opposition. Under the Order of 1886, new works were duly carried

out; and now the Company found it necessary to apply for another Order to give them authority to raise more capital and confer further powers to meet the increasing demands made upon them. The only serious opposition was that of the District Council; and the grounds of their objections were practically two. The first was that the water supply should be in the hands of the Local Authority, and therefore that the Order should contain a clause enabling the Council to purchase the Company's works. The simple answer to this was that in 1886 they had the option of purchasing, but did not avail themselves of it; and he submitted that it would be unfair and unjust to the Company to include such a clause in the present Order, while there was no reason whatever why the Company should not continue to supply the town and neighbourhood. Then, secondly, the Council objected to the extension of the limits, because they said the Company had not taken any steps to supply the authorized portions of Leigh and Shipbourne. In answer to this, the Company said they had not supplied these districts, with the exception of the Powder Mills, because they had not been asked to do so. Under the new Order, they would be able to provide these places with water when occasion required; and he did not think that part of the Council's objection was worthy of serious consideration. Reverting to the question of purchase, Counsel stated that no public meeting had been called by the Council to ascertain the wishes of the inhabitants. There was in the town a strong Ratepayers' Association; but, as far as he knew, no report had been made by the members to the Council, urging them to acquire the water undertaking.

The following evidence was then given:—

Mr. *James Lees*, the Secretary and Manager of the Company, said the maximum quantity of water pumped in a single day in February, 1886, was 216,000 gallons; while at the present time it was 400,000 gallons. The minimum quantity in 1886 was 168,000 gallons, as against 300,000 gallons now. The number of houses supplied had risen from 1208 to 2260; and the persons supplied, reckoning five to a house, had similarly increased from 6040 to 11,300. In this calculation, the seven schoolhouses, containing about 300 people, were only reckoned as single houses. The estimated population of the urban district had increased from 9900 to 12,500; and the total population in the limits of supply, from 13,000 to 15,800. The quantity of water furnished to the town for watering streets and flushing sewers in 1886 was 1,408,286 gallons; while that supplied last year was 2,501,000 gallons. In the former year the machinery could pump 576,000 gallons in 24 hours; and now the power had increased to 1,344,000 gallons. With regard to the efficiency of the supply, witness said that at present there was an abundance of water, but that, owing to the greater consumption in the summer months, they had been somewhat strained to keep a proper store. He considered it most essential that the Company should acquire some further gathering-ground; and an ample supply of water was to be obtained from the Racecourse meadows. Four trial borings had resulted very satisfactorily—in fact, they had exceeded anticipations. The total estimate of the proposed new works was £30,000; the items being as follows: New service reservoir, £6200; water-tower, £5400; cost of Racecourse meadows (including £200 incidental expenses), £5500; wells, conduits, and branches, £4000; new pumping-engines, £2300; mains, meters, and services, £5350; contingencies, £1250.

Mr. *Baldwin Latham* said he was conversant with the district, and knew the position of the water-works. It was a difficult district from which to get a good supply of water, and the works were favourably located. He described the character of the Racecourse fields as a gathering-ground, and said it was impossible for the flood water to permeate through the clay to the underground river in the gravel bed, even after the trench had been opened and filled in again. The acquisition of the land was quite necessary for the protection of the works. He held that the Company's proposal to extend their plant was a proper and judicious one. The purchase of the water-works would cost the town an added rate of 1s. 6d. in the pound (besides the present water-rate) spread over thirty years, for the Company would be entitled to the new capital and to all their back-dividends; while there was a likelihood of further dividends being earned. He did not think the insertion of a purchase clause in the Order would be to the interest of either the town or the Company; and if one were inserted, it should not apply for more than twelve months.

Mr. *John Fagg*, Chairman of the Company, said they had no wish for the Council to take over the works; and the Directors were not authorized to agree to a purchase clause. Questioned as to the attitude of the town in 1886, witness said that during the agitation about the proposal of the town to take over the works he was elected Chairman of the Local Board by a large majority of votes. There was a strong feeling at the time in favour of the Water Company; and there was not now such a feeling in favour of the purchase of the works. The town was very well satisfied with the purity of the supply. The Company had never been in a more efficient state than they were at present; and therefore he considered the Council could not reasonably and fairly acquire the undertaking.

Mr. *C. E. Warner*, Solicitor to the Company, said that when the negotiations took place in 1886 for the purchase of the works, the Local Board offered £19,000, and the Company wanted £20,000. The offer was subsequently extended to £19,500; and the Inspector, to whom it was left to set a fair price, put it at £19,750. With regard to the present attitude of the town, witness said he was a member of the Ratepayers' Association, and he had not heard the slightest rumour that it was the wish to purchase the water undertaking—in fact, he knew the town did not want to have it. In answer to the Inspector, witness said the negotiations in 1886 went off on the question of price. The Local Board opposed the Company's application *in toto*, as the Council were now doing.

Mr. Boxall then addressed the Inspector in opposition to the application. He said the Local Authority had a right and a duty to supply the district with water; but at the present time he frankly admitted that the District Council stood at a disadvantage, inasmuch as the period for buying the works had lapsed. It was, however, a very narrow majority which settled the matter.

Evidence having been given on behalf of the Council,

Mr. Boxall urged that, if the Order were allowed, it should contain a purchase clause similar to that included in the Order of 1886; and he asked that the matter should be delayed so as to give the Council time to present their case to Parliament. With regard to the details of the Order, he objected to the proposed site of the new gathering-ground; and he further argued that the Company's rate of charge was excessive, that the proposed new capital was unnecessarily large, that the qualification of the Directors was not sufficient, and that the dividends should be reduced.

Mr. Reader Harris, in reply, said the only point for the Inspector to decide was whether or not the Local Authority should have a clause inserted in the Order, giving them the option of purchasing the undertaking. To succeed in this, the Council must prove two things—first, that it was the wish of the inhabitants; secondly, that the town would be better for the acquisition of the works. As far as his experience went, the inquiry was singular from the fact that those two most important points had been carefully avoided by the opposition.

The inquiry, which had lasted nearly seven hours, then closed.

The Board of Trade have granted the Order, with a few modifications. The Company are authorized to raise £23,000 additional capital, with further borrowing powers to the extent of £5750. The Board have not inserted the purchase clause applied for by the District Council, as they found there was no general wish on the part of the town to acquire the undertaking. The Company have therefore secured all the powers they asked for.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There are words which, when once uttered, the speaker feels would have been better left unsaid. There are not a few items which appear in this column that, even before writing, I have a feeling that I would gladly pass by. One of these comes before me this week, in the resignation by Mr. Andrew Wilson of the post of Engineer and Manager to the Perth Gas Commission. The closing of a chapter in the life of a young man of great promise, such as this is, cannot be contemplated with any other feeling than that of extreme regret, and a dislike to dwell upon it. But personal feeling cannot be allowed to weigh against the accepted duty of chronicling events of interest; and this being one of great interest to many, the story must be told. Happily, the spirit in which the "Journal" is conducted enables me to deal with this subject in a manner which, in the result, I hope, will be found to be just to all parties, and satisfactory to the readers.

Mr. Wilson was appointed Manager at Perth at the end of 1895, in succession to Mr. T. Whimster, who had then resigned the post, after holding it for many years. Mr. Whimster's retirement occurred at a time when the Commissioners had just resolved to transfer the city gas-works to a new site; and in seeking for a successor, regard was had to the selection of one who would be able to prepare plans and specifications for the new works. Mr. Wilson was unanimously appointed, out of 43 applicants. His tenure of office has not been happy. This has been entirely owing to the difficulties in the arrangements for the new works. There was sufficient to occupy a Manager in the ordinary duties of the existing works, without the addition of all the labour connected with re-modelling the undertaking. The works were considered to be too small in Mr. Whimster's day; but since then—or, to be precise, during the last five years—the output of gas has increased by 50 per cent. How to work under such conditions as Mr. Wilson was obliged to face, would have puzzled many a man. Yet the gas supply has all along been satisfactory; complaints having been fewer than before. But with reference to the new works, it has been otherwise. Mr. Wilson found time to prepare plans for them, which were adopted. When, however, tenders were invited, it was found that, instead of the Commissioners being able to erect the works for £50,000, the cost would be over £70,000. The Commissioners called in Mr. W. Foulis, of Glasgow, to advise them; and under his guidance fresh plans were prepared, in accordance with which the new works are in process of erection, under the direction of Mr. A. Gillespie, of Glasgow. All this has given occasion to a good deal of angry discussion. I have never been able to hold the Commissioners free from blame for the bungling which occurred. They appointed a man but a few years out of his teens to one of the hardest of all the gas manager posts in the kingdom, and, in effect, asked him to utilize his spare time in preparing plans and specifications for new works, capable of producing a certain quantity of gas, and which were to cost no more than £50,000. The Commissioners gave him no assistance in the work, neither inside the office by the increase of the staff, nor outside in the form of visits to other places to procure information, which is almost always resorted to. I think it is undeniable that the Commissioners did not do their part. Whether Mr. Wilson did his part, is a question which is not unattended with difficulty. The Commissioners believed that he did not. In June of last year, a motion was duly brought forward in the Commission, which proposed that his appointment be re-considered. The motion was defeated by 17 votes to 2. With the exception of the two who spoke in support of the motion, the tone of the meeting was not antagonistic to Mr. Wilson. The Commissioners seemed to be inclined to share the blame for the mistake about the first plans, seeing that they adopted them. One of the points complained of by the opposition was that, on account of the changes in the plans, a great deal of excavation, and the erection of boundary walls, had been rendered unnecessary. I mention this, because it seems to be over the erection of a wall that Mr. Wilson's resignation has been sent in. It was stated at the meeting that the Commissioners have had the question of the sufficiency of this wall under consideration in Committee for five months. This would correspond with the period of the municipal election, at which time ex-Bailie Cuthbert ceased to be Convener of the Works Committee, and his place was taken by Mr. Watson. The new *régime* seems to have been more exacting than the old. At all events, to use the words of Mr. Watson, the work upon this wall "had been found to be very defective in many respects, in quantity and quality. Some of the work had not been done at all, and had been charged for; and in many other respects it was deficient." The Commissioners had consulted Counsel upon the subject; and had been advised that they had a good ground of action against the builders. Instructions have accordingly been given to institute such an

action. This was agreed to at a private meeting, which was held on the 19th of March. At the same meeting, Mr. Wilson's letter of resignation was read, and it was agreed to accept it. One gentleman—a Mr. M'Vicar—dissented; and, curiously enough, he was the seconder of the motion in June last for the reconsideration of the appointment. This little incident leads me to the conclusion that everything is not known about the circumstances which have led up to the resignation. Indeed, at a meeting of the Commissioners last Monday, at which the proceedings of the private meeting were confirmed, it was mentioned that the public would know in good time what was going on. Immediately afterwards, there cropped up a remark about actions being also raised against Mr. Wilson and the Clerk of Works; but the suggestion was not taken up, as it was felt that they must adhere to the advice of Counsel. It, however, looks ominously as if what was referred to as "going on" is this matter of further litigation. The Mr. M'Vicar whom I have alluded to as dissenting from the acceptance of the resignation, moved that these further actions should be raised; but he received the support of only one colleague. Thus the matter stands. No reason has been given for Mr. Wilson's resignation; no time has been announced at which he is to cease his duties; and no resolution has been come to with regard to the filling up of the vacancy.

The resignation is the topic of the hour. There is a desire for information as to what has led to so serious a step being taken by Mr. Wilson. I am afraid that upon this point everyone will require to make up his mind for himself, from the facts which I have been able to give. I have no information on the subject; and in view of threatened litigation between the parties, my opinion is that it would be unwise to press for a fuller knowledge of the circumstances. If the actions go on, the conduct of both parties will be subject of inquiry, and curiosity will then be satisfied to the full. Any opinion one might form meantime would virtually be a judging of questions before hearing the evidence, which would be worse than useless. It is not, however, inconsistent with the keeping of an open mind upon the subject, to say that our sympathies are with Mr. Wilson in his trying present position.

Mr. W. R. Herring, of Edinburgh, has favoured me with a draft copy of his paper read at a meeting of the Royal Scottish Society of Arts on Monday; and I have forwarded it to you for publication. The subject was the general one of "The Carbonization of Coal for the Production of Illuminating Gas"—a field which was wide enough to have afforded material for a variety of communications. By judicious selection and condensation, Mr. Herring not only brought the subject down to the compass of a single evening's topic, but he did so in a manner which made it easily comprehensible to hearers who were not familiar with the details of gas making. Gentlemen contributing papers upon scientific subjects frequently crowd too much detail into them, with the result that time is wasted, and the audience get befogged, and cannot follow the speaker. Mr. Herring avoided this pitfall; and, as a consequence, his hearers went home from the meeting with a far clearer conception than they ever had before of the problems which are at present engaging the attention of those who take an interest in gas supply. A great deal of the information which is conveyed to members of such societies must be of the academic sort; but in this instance, the subject being one in which the whole community of Edinburgh are interested, the paper will doubtless bear fruit. Members of such societies exercise an influence upon public questions; and the better educated they are, the more beneficial will be their influence. The communication was thus most appropriate. Whether Mr. Herring intended it or not, its educative effect will be as I have said. Specially noticeable in this connection were the two items dealt with, of incandescent gas lighting and the use of inclined retorts. The first of these brings, almost startlingly, before us the possibility of our being within a few years of a vast revolution in gas production, in which high-grade illuminating gas will almost disappear. When inclined retorts are spoken of, the subject becomes of interest to a much wider circle than that to which the paper was addressed. If a saving such as Mr. Herring speaks of can be effected by the use of inclined retorts, they are likely to become much more general. I suppose, in the matter of saving, a great deal lies in the working of them; and the results stated may probably be taken as the best which can be obtained. But much less would be sufficient reason for adopting the system in preference to other methods of producing gas. Mechanical stoking would go to the wall; and enrichment processes would have a hard struggle to maintain their existence alongside the cheapened coal gas. The new Edinburgh and Leith works will not be a great experiment, because the experimental stage is past; but they will be a big step out of the common. Their working results will be awaited with eagerness. Unfortunately, it will be two years before these will be available. The vista is full of possibilities. Who can tell what the effect would be if, with a combination of inclined retorts and incandescent gas lighting, it were possible to sell non-illuminating gas at 1s. per 1000 cubic feet? For one thing, the industry of gas production and supply would be established on a much firmer basis than ever; but what about the capital accounts of corporations or companies supplying electric light.

The fire at the ammonia works in the Shotts Iron-Works, to which I referred last week, was extinguished by the use of steam and water. A scrubber, 120 feet in height, was rent by the explosions of gas; and it fell, causing great destruction. The total damage is estimated at over £10,000. One workman was fatally injured.

The accounts relating to the electrical installation belonging to the Paisley Corporation, show, including a sum of £681 placed to reserve fund, a deficit of £1883. The deficit is chargeable to the local rates. This is what the Paisley Provisional Order says; but the Corporation are to meet it out of the surplus in the accounts of the gas undertaking.

The Lancaster Town Council have, in reply to a letter from the Morecambe District Council, expressed their willingness to supply the district with an additional 300,000 gallons of water per day, at 8d. per 1000 gallons. This will double the quantity that Lancaster is at present under contract to supply. The agreement is subject to a four years' notice of termination from either side.

The Gas Committee of the Bradford Corporation have passed a resolution agreeing, in accordance with a request of the City Council, to undertake the lighting of the added districts on the same principle as that which applies to the districts in the old city area which are not included within the Corporation gas-supply area. The Committee have also instructed the Gas Engineer to convert the whole of the ordinary street-lamps in the city into incandescent lamps.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 859.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14—15	..	5 0 0
800,000	100	Jan. 2	5	Australian 5 p. c. Deb. .	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd. . . .	6¼—6¾	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid .	4¼—4¾	..	5 1 1
880,000	Stk.	Feb. 28	12	Brentford Consolidated	267—272	..	4 8 3
270,000	,,	,,	9	Do. New . . .	208—208	..	4 6 7
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb. . .	118—123	..	3 5 1
220,000	Stk.	Mar. 14	11½	Brighton & Hove Orig. .	242—247	−8	4 13 1
226,320	,,	,,	8½	Do. A. Ord. Stk. .	180—185	..	4 11 11
999,500	Stk.	Feb. 23	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	41¼—42¼*	..	4 13 0
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c. .	24—26	..	4 12 4
79,003	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9⅜—10¼	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	99—101	..	3 19 3
150,000	20	Mar. 14	8½	Cagliari, Ltd. . . .	25—27	..	6 2 3
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	15¾—16¾	†½	4 17 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct 13	13½	Commercial Old Stock .	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do. .	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p. c. Deb. .	142—145	..	3 2 1
800,000	Stk.	Dec. 14	9	Continental Union, Ltd.	160—170	−10	5 5 11
200,000	,,	,,	7	Do. 7 p. c. Pref. .	178—183	..	3 16 6
51,600	Stk.	Feb. 23	14	Croydon A 10 p. c. . .	335—340	..	4 2 4
173,400	,,	,,	11	Do. B 7 p. c. . .	265—270	..	4 1 5
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p. c.	122—127	..	4 2 8
60,000	,,	,,	5	Do. 5 p. c. Pref. .	132—137	..	3 13 0
486,090	10	Jan. 26	11	European, Ltd . . .	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid .	15—16	..	5 3 2
14,993,075	Stk.	Feb. 9	4⅛	Gas-light and Coke { 4 p. c. Ord. . .	104—106	..	4 12 5
2,500,000	,,	,,	3½	3½ p. c. max. .	97—99	..	3 10 8
3,799,735	,,	,,	4	4 p. c. Con. Pref.	119—122	..	3 5 7
3,993,975	,,	Dec. 14	3	3 p. c. Con. Deb.	99—101	..	2 19 5
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13¾—14¼	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	211—214	..	4 13 6
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red.	100—103	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd. .	4¾—5⅛	..	5 9 1
560,000	100	Oct. 2	5	Met. of 5 p. c. Deb.	110—114	..	4 7 9
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	107—109	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd. . .	11—12	..	5 0 0
667,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.	215—220	..	4 4 1
299,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb. .	104—107	..	3 5 5
60,000	5	Feb. 23	7	Ottoman, Ltd. . . .	4⅞—5⅛	..	6 13 4

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6⅝	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5
500,000	100	Dec. 1	6	People's Gas of Chicago { 2nd Mtg. Bonds .	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord. . . .	11¼—11¾	..	5 19 2
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
250,000	10	Sept. 15	8†	San Paulo, Ltd. . . .	11⅜—12½	−½	6 8 0
135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
5,600,000	Stk.	Feb. 23	5⅜	South Metrop., 4 p.c. Ord.	135—138	..	3 17 3
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb. . .	100—102	..	2 18 10
120,000	Stk.	Mar. 14	6	Tottenham and Edmonton { A. 5 p.c. B. 3½ p.c. 4 p. c. Deb.	139—141	..	4 5 1
250,520	,,	,,	4½		100—102	..	4 8 3
55,100	,,	Dec. 14	4		113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.	8—9	−½	5 11 1
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	101—104	..	4 16 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.	307—312	..	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref. .	157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145—150	..	3 0 0
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .	145—150*	..	3 0 0
1,720,560	Stk.	Oct. 13	7	East London, Ord. . .	202—207	−3	3 7 8
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
390,000	,,	,,	3	Do. 3 p. c. Deb. .	99—101	..	2 19 5
700,000	50	Dec. 14	7½	Grand Junction { 10 p.c. max. . 4 p. c. Deb. .	108—110	..	3 8 2
310,000	Stk.	Mar. 29	4		130—135*	+1	2 19 3
708,000	Stk.	Feb. 23	14	Kent	307—312	−1	4 9 9
160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max. .	295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p. c. max. .	215—220	..	3 12 9
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .	130—133*	..	3 0 2
500,000	100	Feb. 23	13⅓	New River, New Shares	420—425	..	3 3 6
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb. .	132—137	..	2 18 5
902,300	Stk.	Dec. 14	7½	South-wark Ord. . . .	200—205	..	3 13 2
126,500	100	,,	7½	7½ p. c. max. .	190—195	..	3 16 11
489,200	Stk.	,,	5	and 5 p. c. Pref.	160—165	..	3 0 7
1,019,585	,,	Oct. 13	4	Vauxhall 4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	16	West Middlesex . . .	288—293	..	3 8 3
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
200,000	,,	Mar. 14	8	Do. 8 p. c. Deb. .	99—101	..	2 19 5

*Ex div.

† Next dividend will be at this rate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 31.

Sulphate of Ammonia.—There has again been a quiet market; and quotations have declined to £11 17s. 6d. to £12 per ton, delivered f.o.b. at the ports. There has been more inquiry. But, requirements not being urgent, there has been no hurry to cover; and buyers have only been induced to purchase by concessions in prices. There has also been more interest in the forward position; and speculative sales have been made abroad at a decline on recent quotations. Makers, however, maintain a firm attitude.

Nitrate of Soda is steady; the spot quotations being 8s. 9d. per cwt. for ordinary, and 8s. 10½d. for fine, quality.

LONDON, *March* 31.

Tar Products.—Pitch continues to enjoy a steady market. A good deal of inquiry is going on for next season's delivery; and considerable business is reported in that position. It is not unlikely that the actual production of pitch for this season will be less than anticipated. The value of liquid creosote is well maintained; and tar oil is commanding a better price than creosote containing salts. Salty creosote, however, is a little steadier, with a somewhat better outlook. Benzols are very dull; and lower prices are being named, especially for 90's quality. There is no change in naphthas; and anthracene is only in moderate request. The relapse in carbolic acid has apparently stopped; and the tendency is rather to better prices. There are no stocks either in producers' or consumers' hands.

Prices obtaining during the week are: Tar, 17s. 6d. to 27s. 6d. Pitch, east coast, 37s.; west coast, 34s. Benzol, 90's, 6d.; special qualities for gas, 8d.; 50's, 9d. Toluol, 90's, 1s. 1d.; pure, 1s. 9d. Solvent naphtha, 1s. 1d. Crude, 30 per cent., naphtha, 4d. Heavy naphtha, 10d. Creosote, 2½d. to 3¼d. Heavy oils, 3½d. Carbolic acid, 50's, 2s. 1½d.; 60's, 2s. 6d. Naphthalene, 45s. to 70s. Anthracene, "A," 4d.; "B," 2½d.

Sulphate of Ammonia.—Quite an unexpected drop in prices has come over this market during the week, and at all ports it is quoted less money. It is felt, however, that the relapse is only temporary; there being no stocks, and certainly no urgent sellers. The backwardness of the season no doubt has a good deal to do with the present position. Although sellers would probably not accept the price, the average market quotation to-day is £11 17s. 6d., less 3½ per cent. at all ports.

The Newhaven District Council are carrying out a little experiment with incandescent gas-burners; and at the last meeting, one of the members stated that the lamps were giving a splendid light. He also mentioned that the Manager of the Gas Company had told him that, during the recent heavy gales at Brighton, only two out of eight mantles on the West Pier required to be renewed.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Perhaps, if anything, taking the market all through, the position is not quite so strong. Lancashire collieries do not give way in the least on their full list rates; but supplies of both round coal and engine fuel continue to come in from outside districts at lower figures, and this has necessarily a somewhat weakening effect. Buyers not only show a disposition to keep back orders from Lancashire collieries at the full rates to which the latter are holding, but they are able to purchase more freely elsewhere; so that the general pressure of demand is not quite so great. Lancashire collieries are, however, still moving away all they are raising, unless it is that here and there some of the better classes of round coal are hanging. Nothing is going down to replenish the stocks, which, for the most part, are almost entirely cleared away. List rates are unchanged; best Wigan Arley remaining at 14s. 6d. to 15s. 6d. per ton at the pit, Pemberton four-feet and seconds Arley 13s. to 14s., steam and forge coals 12s. to 12s. 6d., and engine fuel from 9s. 6d. for medium to 10s. 6d. for the best sorts. The advance on gas coal for next season's contracts, referred to recently, has now not only been definitely confirmed by the leading collieries throughout Lancashire, but a similar undertaking has been come to in Yorkshire; and both these important gas-coal raising centres will co-operate in maintaining the full prices when the contracts are sent in. These prices, as previously stated, will represent an advance of 5s. per ton on last year, which will bring the minimum pit prices to 12s. 6d. and 13s. for the lower qualities, and 14s. 6d. for the best screened gas coals. The shipping trade is scarcely so brisk; and although the collieries that do a shipping trade are still holding to their minimum basis of 16s. for steam coal, delivered at the Mersey ports or the Ship Canal, business is not being obtained freely at this figure. Coke makers have withdrawn present list rates, pending a substantial advance to come into operation this month.

Northern Coal Trade.—There is a fair demand for most classes of coal; but that for steam coals is rather limited for immediate shipment. Hence best Northumbrian steam coals are now rather weaker, at from 17s. 6d. to 18s. per ton f.o.b., though higher prices are asked when the delivery is over the shipping season. Steam smalls are 11s. to 11s. 6d. per ton f.o.b. In the gas coal trade, attention is directed to the great contracts for the Metropolitan Companies, the negotiations for which have now begun. It is said that some of the collieries have decided to ask an advance of 7s. per ton on last year's price, and thus bring the general quotation to something like 16s. per ton. f.o.b.! It remains to be seen how far the expectation that such a quotation suggests will be fulfilled. The contracts for the supply of one or two of the northern boroughs are now in progress of ratification; and that for Darlington shows a price somewhat equivalent to the one named for the larger supplies. In the gas coal trade, the price is not altered for occasional cargoes. Coke is extremely firm; and blast-furnace coke is higher at 28s. 6d. at the furnaces. Gas coke shows no change in price this week; but it is rather scarcer.

Scotch Coal Trade.—There is a quieter tendency in the market; but

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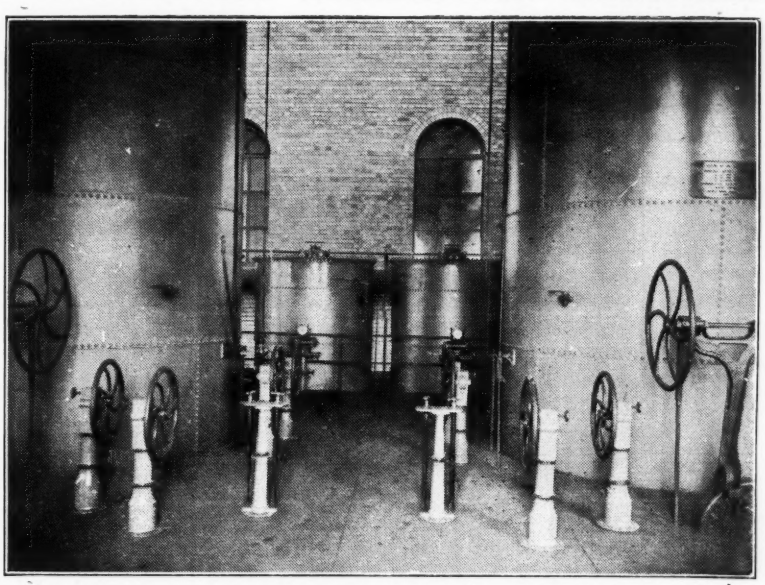

RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

prices are not appreciably easier. The demand is still heavy, and is likely to continue so, if for no other reason, because of the great demand there is for iron, both in this country and out of it. The season for contracting for gas coal has begun. So far, it has been the reverse of encouraging for managers of gas-works. It is now quite evident that there will be a general rise in the price of gas; and that if any managers are able to avoid this step, they will have a hard struggle. The prices quoted are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 15s. to 16s., and splint 14s. 9d. to 15s. The shipments for the week amounted to 186,397 tons—a decrease of 15,317 tons upon the preceding week, but an increase of 75,150 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,166,424 tons—an increase of 551,288 tons upon the same period of last year.

The following remarks on the London Gas Companies' coal contracts and the price of gas appeared in the "Financial Times" last Thursday: "The important contracts for supplying the two great London Gas Companies with gas coal always excite particular interest in the coal trade, and with some reason, for they are the largest contracts that come into the British coal market. The contracts, according to a well-informed northern correspondent, are now offering in the Newcastle market, and will shortly be concluded—if buyers and sellers can come to terms. It is scarcely necessary to explain that the Companies indicated are the Gaslight and Coke Company and the South Metropolitan Gas Company. The former annually consume about 2 million tons, and the latter about a million, which quantities are, of course, mainly—indeed, almost solely—drawn from the Durham coal-field; and to transport the fuel from the Tyne or Wear to the Thames keeps in regular employment a large fleet of steam colliers. Both Companies, we understand, have now opened negotiations with the leading Durham coal firms to renew their contracts for the ensuing twelve months—in the case of the Gaslight and Coke Company from July next, and in the case of the South Metropolitan Company from April. How the negotiations will conclude in the light of the present extraordinary strength of the coal market, is a matter about which there is a good deal of speculation. So far as we are able to learn, we believe that several of the Durham colliery firms have already intimated to these Companies that their price will be 16s. a ton f.o.b. Tyne or Wear. Certainly this figure, and more, has already been secured for large gas coal contracts. In several instances lately 16s. 6d. to 17s. a ton has been realized—a case in point being that of the Imperial Continental Gas Association, which, little more than a week ago, contracted for about 200,000 tons, to be delivered at Swinemünde and Stettin at about these figures f.o.b. Of course, the London Gas Companies are large and influential buyers; and they may be able to purchase their requirements at something less than smaller consumers have been compelled to pay, though this remains to be seen. In bad times these Companies undoubtedly get the full advantage of low prices, and in good times, like the present, they must, we suppose, expect to pay up. Should the actual price turn out to be in the region of 16s., which the north country coalowners say they are quoting, it will mean an advance of about 7s. a ton on last year's contract rate. Such an advance on so large a quantity of coal would represent an increased expenditure on the part of the Gas Companies, which the poor London householder must shudder to contemplate, for does it not portend a rise in the price of gas? One thing is certain, and it is this—that the London Gas Companies have not been called upon to pay such prices for their coal as they will have to pay this year since the great 'boom' of the early seventies. How far they will be able to work the market in their favour, and by what process of financing they will recoup themselves for a greatly increased expenditure on coal account, are matters which the next few weeks will, no doubt, reveal. They are matters, too, in which the average Londoner cannot fail to have a pocket interest."

The "Iron and Coal Trades Review," referring, last Friday, to the coal question as affecting the price of gas, said: "The general attitude of the public in relation to coal prices was probably accurately reflected in some remarks made recently by the President of a leading Gas Association, when he stated that none would object to pay a remunerative price to the coalowner, so long as it was a reasonable and equitable one, if it was uniform and steady. It is the extremes of depression and sudden abnormal increases that are so much to be deprecated. The policy of gas authorities of late has been to reduce the price of gas to the lowest possible limit, until there is now no margin left for such an unlooked-for rise in the price of raw materials as we have recently seen. What the effect will be upon prices at present ruling, time will show. Already it has had an appreciable effect in some quarters; and unless coal prices come down to a reasonable figure before new contracts are entered into, an increase in the price of gas will be inevitable. If trade remains good, an increased output of gas, and augmented prices for coke and other residual products, may help gas companies. Gas authorities may also go in wholesale for installations of carburetted water-gas plant. If so, when the 'boom' has passed, coalowners must not be surprised if they find the demands of many of their customers diminished. What with depleted stocks, the difficulties of getting supplies, and the troubles caused by the railway companies in dealing with the transit of material, many gas authorities have been seriously handicapped of late, and more than ordinary difficulty has been experienced in keeping up the supplies of gas."

The Cost of Coal and Increases in the Price of Gas.—The Corporation of Nottingham have decided, "in consequence of the increased cost of coal and other materials," to raise the present charge for gas by 4d. per 1000 cubic feet from the end of March. For the same reason, the Fenton District Council have resolved to advance the price of gas by 6d. per 1000 cubic feet, and to rescind the resolution of the Gas Committee of March 20, 1899, with respect to the reduction of public lighting by £200 per annum. The Truro Gas Company have raised their price to 4s. per 1000 cubic feet, subject to the usual discounts for prompt payment. The quantity of gas supplied to "slot" consumers has been reduced to 18 cubic feet for 1d. The Darlington Corporation have decided to raise the price of gas to 3s. 3d. per 1000 cubic feet, with the usual discount of 6d., at the close of the present quarter.

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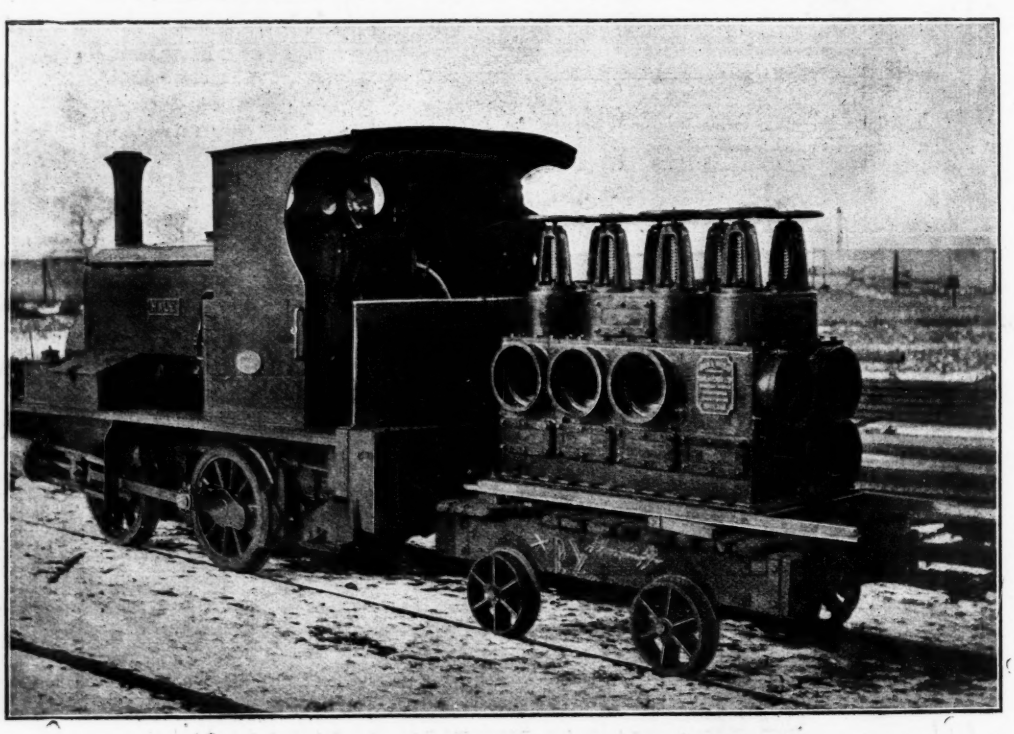

One of a number of small Weck's Valves for immediate Shipment.

West's Stoking Machinery for the Halifax Gas-Works.—The Halifax Corporation Gas Committee have decided to adopt power stoking machinery in their works; and they have placed a contract with West's Gas Improvement Company, Limited, for the supply and erection of complete installations of their compressed air stoking machinery, in a twin retort-house containing a double line of benches.

Teesside Water Supply.—The Tees Valley Water Board have arranged to inspect a site for a new reservoir at Long Newton, near Stockton-on-Tees. Already the plans have been prepared. The work will be let to contract within the next two months; and it will, it is expected, be completed in the course of two years. It is estimated that the enterprise will entail a cost of something like £80,000 or £100,000. Within the next twelve months it is proposed to make a start with the Grassholm reservoirs, the construction of which will take about ten years. This scheme, with interest and redemption, will cost upwards of £250,000.

Suffocated by Gas.—A naval stoker named Bennett, of Her Majesty's ship *Vivid*, at Devonport, and Thomas Ash, aged 79, a naval pensioner, were suffocated in a lodging-house at Stonehouse last Sunday morning. The men occupied separate beds in the same room, which had no fireplace. About noon yesterday the landlord went to call the men for dinner; and on opening the door was driven back by a rush of gas. A constable was called in, and found both men dead. Close to one of the beds was a gas-bracket, the tap of which could be turned by the sleeper's foot. It is stated that both men were sober when last seen by the lodging-house keeper.

The Supply of Water Gas in Dublin.—At the annual meeting of the Dublin Sanitary Association last Thursday, reference was made to the high mortality in the city, which is being investigated by a Committee appointed by the Lord Lieutenant; and the new President of the Association (Dr. C. F. Moore) said they hoped good would result from the labours of the Committee. He drew attention to what he characterized as the "danger to public health" caused by the gas now being produced by the Alliance and Dublin Gas Company, which, he said, contained a very large amount of carbon monoxide, which was very poisonous. Sir Charles Cameron informed the Association that the Company had agreed not to exceed 20 per cent. of water gas.

Oldbury Gas Department.—The statement of accounts in connection with the gas undertaking of the Oldbury District Council for the year ending Dec. 31 was issued last Saturday by Mr. A. Cooke, the General Manager. It shows that the cost of gas manufacture was £7959, against £7443 in 1898. The total expenditure was £11,063, against £9621. The net income from the sale of gas amounted to £12,265—an increase of £445; residuals produced £3812, as compared with £2915; sales of gas-fittings realized £241; and discounts on purchases £58—the total income being £16,376, or £1371 more than in 1898. This gives a gross profit of £5313. After paying £2972 for interest on loans, transferring £600 to the general district rate, and voting £50 towards the new Technical Schools, there remains a net profit on the year's working of £1713 17s. 2d.

Guildford Gas Company.—The ordinary half-yearly general meeting of this Company was held at the offices, Guildford, on the 29th ult.—Mr. D. Williamson, J.P., the Chairman of the Company, presiding. The accounts for the six months ending Dec. 31 showed a balance carried from revenue to the profit and loss account amounting to £2916, against £2504 in the corresponding half of 1898; and after payment of full dividends, there remains to the credit of that account a sum of £1976, while the reserve fund has a balance of £7814. During the last two or three years, rapid progress has been made by the Company. In 1897, the annual make of gas was 120 millions; while last year it had risen to more than 139 millions—being an increase of nearly 16 per cent. One of the chief causes of this has been the adoption of prepayment meters; more than 400 having been fixed since their introduction two years ago. Great strides have also been made in letting out cooking-stoves on hire. The Town Council have given the Company orders to alter the whole of the lamps in the town from ordinary flat-flame burners to incandescents; making something like 400 lamps which have been changed to the latter system during the past two years.

Rushden and Higham Ferrers Gas Company.—The annual general meeting of this Company was held last Friday—Mr. Paul Cave in the chair. The Secretary (Mr. G. S. Mason) read the report, in which it was stated that, notwithstanding the increased cost of coal and the reduction made in the price of gas, the profits available for distribution had been maintained. The Directors therefore recommended the declaration of a dividend at the rate of 10 per cent. per annum on the ordinary stock, free of income-tax, and the setting aside of a sum of £200 to form an insurance fund to meet any extraordinary claim or charge which might fall upon the Company. They felt they could confidently state that the works, under the supervision of Mr. Thomas Watson, were maintained in the highest state of efficiency, and that every reasonable provision was being made to meet the ever-growing demands of the two towns. When the draft of the Company's Bill of last session was before the shareholders, care was taken to insert a clause conferring on the Company power to enter into special contracts with consumers, and thereby give the shareholding consumers the benefits corresponding to the bonus previously paid. When, however, it came to be worked out, it was found that the complications arising from such contracts would be so great that the Directors, with much reluctance, had no alternative but to abandon them; and in lieu thereof they resolved to reduce the price of gas for motive power by 2d. per 1000 cubic feet, applicable to shareholders and non-shareholders alike. After some remarks on the matter, the report was adopted. Referring to the admirable way in which the accounts had been kept, Mr. W. H. Wilkins pointed out that the record of the gas made and the coal consumed was carried out with such detail that the Manager accounted for the whole of the gas made with the exception of about 5 per cent., whereas most companies reckoned anything within 10 per cent. as a high state of efficiency. He must compliment him on the great care and accuracy he had shown. The Chairman expressed his gratification at hearing the compliments paid. The Manager was pleased to do his best; and there was no doubt his heart and soul were in his work. Mr. Watson briefly returned thanks.

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Additional Capital for the South-West Suburban Water Company.—The Board of Trade have granted, subject to the approval of Parliament, the Order applied for by this Company to enable them to raise additional capital not exceeding £50,000.

Chorley Gas Affairs.—In proposing the confirmation of the minutes of the Gas Committee at the meeting of the Chorley Town Council last Thursday, Mr. Critchley stated that there had been a large increase in the consumption of gas during the past year, amounting to more than 8 million cubic feet. The receipts from sales were £15,968—an increase of £1360. The gross profit was £7597; and there was £840 available for reducing the rates. The balance-sheet was considered satisfactory.

San Paulo Gas Company, Limited.—At the annual meeting of this Company next Friday, the Directors will report a profit of £21,571, to which has to be added the balance brought forward, £1376; making a total of £22,947. After deducting £1500 for debenture interest, there remains a disposable balance of £21,447. An interim dividend of 5 per cent. (£12,500) was paid in September; and the Directors recommend the declaration of a final dividend at the rate of 6 per cent. per annum, free of tax—making a total distribution for the year of 8 per cent. This will absorb a further sum of £7500; leaving £1447 to be carried forward. The reports of the Manager and Engineer show that the Company's works, buildings, and plant generally have been maintained in good working order. Having had to abandon their electric lighting scheme, the Board are doing their best to popularize the use of gas, and to this end have acquired the Welsbach agency in San Paulo; while the new Railway Station is to be lighted by an installation of intensified gas.

Bristol Water Company.—The report of the Directors of this Company sets forth that the revenue from water-rates for the past year was £122,858, exceeding that of the previous year by £5079. The net sum shown by the revenue account (including £6829 brought forward) to be applicable for dividend on the ordinary capital of the Company is £57,441. Out of this the Directors paid, on the 14th of October, an intermediate dividend at the rate of 7¼ per cent. per annum on the ordinary £25, £20, £6, and £4 10s. shares, and £5 1s. 6d. per cent. per annum on the 7 per cent. maximum consolidated ordinary stock, leaving a balance of £33,680 applicable for dividend on the ordinary capital. The Directors recommend the payment of final dividends at the respective rates of 7¾ per cent. per annum on the ordinary shares, and £5 8s. 6d. per cent. per annum on the ordinary stock of the Company, leaving a balance of £8078 to be carried forward. The increase of revenue is again very satisfactory. The progress of the works in the Yeo Valley, already described in the "Journal," had so far advanced last November as to permit the impounding of water; and the order for pumping-engines to utilize this source of supply will be executed next year. A contract has been entered into for the construction of two more filter-beds at Barrow Gurney, in order to meet the growing consumption of water. At the Clifton pumping-station, an additional engine is in course of erection, capable of pumping 3 million gallons daily. The Bill for granting further powers to the Company for the purpose of maintaining the purity of the supply is proceeding unopposed in Parliament. The capital expended during the year was £63,050. The length of mains laid was about 7½ miles.

The Heckmondwike Gas-Works and the Local Authorities.—The Finance Committee of the Heckmondwike District Council have decided to recommend the Council to apply jointly with the Liversedge Council for parliamentary powers, empowering them to acquire the Heckmondwike Gas Company's works, which are situated within the area of the Liversedge Council, and supply both towns with gas. In the event of Liversedge declining, the question of Heckmondwike applying for powers separately will probably be taken into consideration.

Exmouth Gas Company.—From the report submitted to the annual meeting of this Company last Wednesday, it appears that the past year was one of great prosperity. There was a good average augmentation in the number of consumers, the make of gas increased by 9·93 per cent., and the balance available for dividend was £2361. Mr. G. Palmer, who presided, said that £1251 had been spent on capital account; and, in order to provide for the extension of the Company's business, £2000 had been raised on 5 per cent. preference shares. The profit for the year was £1647—an increase of £387. The gross receipts were £782 in advance of 1898, and £414 of this was from the sale of gas. Mr. H. A. Willey, in seconding the motion for the adoption of the report, commented upon the improved position of the Company, and expressed the opinion that the proposed introduction of the electric light would be an advantage rather than the reverse. The report was adopted.

Gas and Water Works Extensions at Llandudno.—A Local Government Board inquiry was held at Llandudno last Tuesday with reference to an application by the District Council for power to borrow certain sums of money, among them being £12,104 for gas-works purposes, and £4216 for water supply. Touching the question of the extension of the gas-works, the Clerk (Mr. W. Conolly) said that at present there were three gasholders with a capacity of 190,000 cubic feet, which was only about half the maximum daily make; and the Council were advised that this storage capacity should be increased to a day or a day-and-a-half maximum make. The increase in the daily make of gas last year, compared with that of the previous year, was 45,920 cubic feet; and it was calculated that the daily make in 1906 would be 536,990 cubic feet, for which provision was made by the present scheme. The Council's Engineer (Mr. E. Paley Stephenson) stated that it was important that the work should be commenced without delay. Mr. Caralier, a former member of the Council, wished to call attention to the fact that the gas-works were yearly depreciating in value. The returns for the year 1897 showed the profit to have been £1147, which last year had come down to £245. Mr. Conolly observed that, on the contrary, the profits were becoming more annually. The reason for the apparent decrease was that the Council had taken in hand many additional works for the benefit of the gas concern generally. They had also during the last three years reduced the price of gas—thus giving a direct benefit to the consumers; and they had moreover abolished meter-rents, which meant £400 a year. The Clerk and Surveyor then gave particulars as to a water supply scheme for the Great Orme, which was an amendment on a scheme put forward two years ago. It was proposed to construct a reservoir on land leased from Lord Mostyn. The other matters for which money was required were next inquired into.

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The Dangers of Electricity in New York.—According to a paragraph which is going the round of the papers, New York is a "great dynamo." This is the latest startling statement of the condition of the capital of the New World through the enormous use of electricity in every-day life. Indeed, life and property on Manhattan Island are declared to be menaced by what is called "wild-cat electricity" escaping from the various trolley, heating, lighting, power, and service wires which form a network under and over the surface of the streets. These currents are "eating the heart out of the Brooklyn Bridge," along which enough electricity is declared to be escaping to light a village or run a factory. These currents are wandering on the elevated railways, undermining the tall buildings, and destroying the water, gas, and sewer pipes.

Wath-upon-Dearne and District Gas Supply: The Board of Trade Inquiry.—Mr. Ingram R. Walker, who recently held a Board of Trade inquiry at Wath (see *ante*, p. 819) relative to an application by the Wath-upon-Dearne Gas Company for power to supply gas in Bolton-upon-Dearne, Thurnscoe, and other places outside their present area, has reported to the Board that the Company should be empowered to supply gas in the districts of Wath-upon-Dearne and Bolton-upon-Dearne, the parish of Thurnscoe, and so much of Brampton Bierlow as lies north of the centre of Smithy Bridge Lane and Hoober Hall Lane. As the promoters agreed to strike out Barmbro' and Hickleton from the Order, the Commissioner advised that the Company's total capital should be £32,000 instead of £35,000 as originally asked for, *plus* borrowing powers of one-fourth; and he further suggested that the maximum price should be 4s. 2d. per 1000 cubic feet instead of 5s. With these modifications, the Board of Trade will grant the Provisional Order; and it will now go forward for confirmation by Parliament.

Clevedon Gas Company.—The report presented at the annual meeting of this Company last Tuesday stated that the population of the town having more than doubled since the present plan of works was laid down, the new Manager has found that considerable enlargement was immediately necessary to meet the growing demand for gas. The expense of carrying out the proposed works, the Directors stated, would be distributed over several years. With regard to the accounts, it was announced that necessary renewals and the increased price of coal had somewhat reduced the profits; but the revenue permitted a dividend of 5 per cent. on the three classes of shares. The Chairman (Mr. E. Button), in moving the adoption of the report, mentioned that there had been an increased demand for prepayment meters, the use of which the Company had found very advantageous. A heavy amount had been written off for meters sold and condemned, as they were trying to get the stock into a better condition. The Directors were anxious to keep down any additions to capital, which had been added to somewhat largely in the past; and though they were called upon to extend the works, the cost must be met, as far as possible, out of revenue. Repairs and maintenance of works had cost £648, as against £327; and wages had gone up. The result was that there was a balance of only £918 to divide, as against £1553 last year. The dividend was 1 per cent. less, but he thought this would be only temporary. The report was adopted.

The Price of Gas at Stockton and the Rates.—The Stockton Corporation have decided to increase the price of gas by 6d. per 1000 cubic feet; and yet at the same time they are reducing the borough rate by 9d.! It is explained that this is due to the increased rateable value, a 2d. decrease in the School Board rate, and the fact that it is estimated there will be no loss on the water-works this year. Under such flourishing circumstances, the gas consumers might have been dealt with a little more lightly.

The Old Gas-Works at Hull Cease to Exist.—At ten o'clock on Monday last week, the old gas-works situated at the rear of the Town Hall, Hull, which have been in existence for the greater part of a century, ceased to supply. They were purchased on the 1st of April, 1898, by the Hull Corporation from the Kingston-upon-Hull Gas Company, for the sum of £92,500, and the area of supply was confined to the Old Town within the Docks; the annual output being about 100 million cubic feet. The consumers are now supplied by the British Gaslight Company.

Sales of Stocks and Shares.—Mr. J. Shoesmith recently sold at Halifax 14 fully-paid £5 shares in the Oriental Gas Company, Limited, at £7 each. In accordance with the announcement which appeared in our advertisement columns, Mr. Charles A. Joel sold by auction, on the 20th ult., at the offices of the Newcastle and Gateshead Water Company, £40,000 of the Company's 5 per cent. preference stock of 1894. It was put up in 400 lots, and was disposed of in 40 minutes, or at the rate of £1000 per minute. The prices ranged from £157 to £162 per cent.; and the total amount realized was £63,347 10s., or a little more than £158 7s. per £100 of stock. At the Mart, Tokenhouse Yard, the same day, Mr. Alfred Richards sold, by order of the Directors, £3895 of 4 per cent. perpetual debenture stock of the Southend Water Company, at prices ranging from £116 to £118 10s. per £100 of stock. He also submitted, under similar instructions, £3200 of ordinary stock of the Plymouth and Stonehouse Gas Company, at £130 per cent. The amount originally advertised was £4000; but the remaining £800 was sold privately after the sale at the above-named figure. On the same occasion, £100 of 10 per cent. stock of the Worthing Gas Company fetched £220; and 13 fully-paid £10 new shares (7 per cent.), £15 15s. each. The Southend debenture stock will yield the investor £3 8s. 3d. per cent.; the Plymouth stock, £4 14s. 2d. per cent.; the Worthing stock, £4 10s. 11d. per cent.; and the Worthing shares, £4 9s. per cent. Last Wednesday, Mr. Richards sold £10,000 of 4 per cent. preference stock of the Brighton and Hove General Gas Company, at prices ranging from £100 10s. to £106 10s. per £100 of stock. On the same day, Mr. R. Mack sold by auction, at the offices of the Newcastle and Gateshead Gas Company, in accordance with the announcement which lately appeared in the "JOURNAL," £13,000 of the Company's 3½ per cent. debenture stock. It was put up in £100 lots, which fetched prices ranging from £103 5s. to £105 10s. each—the average being £104 7s. 3½d. The total amount realized by the sale was £13,567 5s. At the offices of the West Hartlepool Gas and Water Company a few days since, £10 shares in the Company were sold at prices ranging from £17 10s. to £17 17s. 6d. each. Some £10 shares in the Norwich Water Company were lately sold for £18 5s. and £18 7s. 6d. each.

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Fire at the Loughborough Gas-Works.—A fire which might have had disastrous consequences occurred at the Loughborough Gas-Works last Wednesday. As the result of an explosion in the tar-tank, a quantity of the tar ignited and created a great flare. Fortunately the fire-engine station is adjacent to the works, and the firemen speedily had the hose at work playing persistently on the blazing liquid. Water, however, appeared to have little effect; and cartloads of sand were fetched to smother the flames. The firemen and the gas-works employees laboured indefatigably, and succeeded in getting the flames under control.

The Hull Corporation and their Water Supply Regulations.—At a meeting of the Water and Gas Committee of the Hull Corporation on Monday last week, a deputation representing the architects in the town waited upon them to urge some modification of the new bye-laws for preventing waste, misuse, and undue consumption or contamination of water. Their first objection was as to the strength of pipes required beyond the cisterns; the contention being that the weights specified in the bye-laws were excessive. The Chairman said that the Committee originally fixed the weights at the figures stated by the deputation, but the Local Government Board increased them in accordance with their model bye-laws. The Committee have a certain amount of liberty given them in the matter, and they would not do anything to harass trade. The deputation's second objection was against the capacity of flushing-cisterns to water-closets being fixed at a minimum of 2 and a maximum of 2½ gallons. They argued—and in this they were supported by the Mayor (Mr. W. A. Gelder)—that the peculiar conditions of Hull necessitated the use of 3 gallons. The Committee decided to consider the question after they had received a report from Mr. F. J. Bancroft, the Water-Works Engineer.

A Medical Journal on Gas-Fires.—The "British Medical Press" recently made the following remarks on gas-fires: "The conveniences of using gas for heating purposes are no doubt numerous; and though the cost of the supply greatly exceeds that of coal, there is much saving in trouble and time to those to whom these are of importance. One point, however, requires some attention, where gas fireplaces—that is, open grates—are fixed in houses. It is found that the combustion products of gas—namely, the fumes of carbonic acid and carbonic oxide—which ought to be entirely carried away by the chimney, are very liable to come back in some amount into the room; and we all know what poisonous effects are produced when we breathe them. We were much surprised to see a gas-stove of considerable size exhibited in one of our leading thoroughfares with a large placard above it stating that a flue was not required. It is necessary to protect those who are ignorant of chemistry and physiology, and do not at once appreciate the dangers attending the use of a gas-stove not provided with a flue. We think it right to draw the attention of our readers to a subject of real importance to the public, and one, moreover, of which members of the medical profession are the most capable of judging. Great improvements are required in ordinary gas fireplaces to secure complete safety from poisonous fumes, since these are not carried away as they should be."

The Recent High Rainfall and the Quality of London Water.—In their report to the Official Water Examiner for the Metropolis (Mr. C. Perrin, M.Inst.C.E.), on the quality of the water supplied to London in February, Sir William Crookes and Professor Dewar state that, of the 192 samples of water examined by them, all were found to be clear, bright, and well filtered. Referring to the effect of the heavy rains on the water supply, they say: "The exceptionally high rainfall of 4·23 inches during the month, following a long drought at this time of the year, has resulted in the organic carbon being higher, and the bacteriological purity of some of the filtered waters being lower, than the average of the last few months. This has been especially the case in three of the Thames-derived waters, the filter-wells of which on some occasions have given abnormally high numbers. So far as we can ascertain, the working of the filters has been conducted with all the customary care and precautions. Similar abnormal results have usually followed the breaking up of a long drought. On careful examination, it is satisfactory to know that the organisms in these exceptional samples are harmless river microbes, and we have been unable to detect among them any other kind of organism. As on previous occasions, the filter-beds that gave these abnormal samples of water were again in a few days working satisfactorily." They add that, in spite of the floods, the bacterial quality of the New River and the Lea supplies was exceptionally good; and among the 150 samples of these waters examined, no abnormal results were found.

The Shrewsbury Corporation and the Arbitration Award.—A special meeting of the Shrewsbury Town Council was held on Monday last week in connection with the recent arbitration between the Council and the Gas Company (*ante*, pp. 549, 685, 817). Alderman the Hon. W. H. Herbert proposed that the Finance Committee be instructed to make arrangements for the necessary payments under the award, which was against the Corporation. The claim of the Company came as a complete surprise to the Sanitary Committee. They would certainly not have paid the Contractor for the sewerage works if they had known of the claim, as, if he had not been paid, the amount of the Umpire's award would no doubt have been recovered from him. It was an extraordinary thing that the £800 cheque paid to the Contractor was signed by Alderman Evans, Chairman of the Sanitary Committee, and a Director of the Company, yet he never gave them the slightest hint that the claim was to be made. Unless Alderman Evans could show that he was in absolute ignorance of it, then he (Alderman Herbert) contended that he had not done his duty to the Committee, the Council, or the public. Mr. Birrell seconded the motion. Alderman Evans replied; but, as the matter was discussed in Committee fashion, he was assailed simultaneously with scores of questions, and made the object of rather strong remarks. He, however, affirmed that his conduct all through had been honourable; and he said that if he had known of the claim at the time he signed the cheque, he would have had his hand cut off before he would have done it. He had over and over again told members of the Committee that the matter might be amicably settled for £700; but they ridiculed the idea, and now they had to pay double this amount. It was not surprising that they felt sore on the point. The motion was carried.

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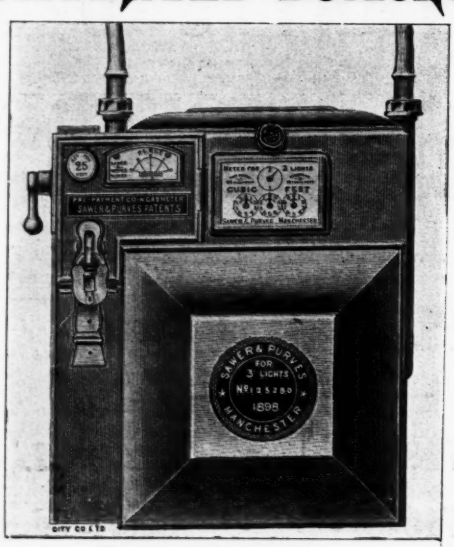

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The North Shields Water Company and the Tynemouth Corporation.—According to a report brought up by Alderman Elliott at last Wednesday's meeting of the Tynemouth Town Council, there appears to have been a little difficulty in connection with the transfer of the North Shields Water Company to the Tynemouth Corporation. The report stated that the Parliamentary and Water Committee had instructed the Town Clerk to take immediate steps, under the Vendor and Purchaser Act, to have the draft conveyance of the transfer of the water undertaking from the North Shields Company to the Corporation settled by the Court. Mr. B. Hewitt said he was glad the Committee had at last mustered sufficient courage to face the inevitable. It seemed to him that the public had a right to some explanation as to the exact position of affairs. Alderman Elliot assured the Council that the difficulties would soon be at an end; and the report was adopted.

Bognor Water Company.—The annual meeting of this Company was held last Friday, under the presidency of Captain Hills, R.N. The Directors' report showed that the income from water-rentals for the year was £2536; being an increase of £231. The profit was £1455, against £1423, for 1898. After payment of interest on the loan capital, the net available profit for the year, with the balance of £517 brought forward, amounted to £1808. The Directors recommended that £970 should be appropriated for the payment of a dividend on the preference shares at the full rate of 5 per cent, and that £447 be used in payment of a dividend on the ordinary shares at the same rate, both free of income-tax; and that the balance of £390 be carried forward. The Chairman, in moving the adoption of the report, congratulated the proprietors on the change which had taken place in the fortunes of the Company, and on the steady progress which was being made. He said it had been found necessary to provide a reservoir, and there was one now in course of construction capable of containing 500,000 gallons, which was an improvement on the 38,000 gallons which was the capacity of the present tank. The report was adopted. At the close of the ordinary business, an extraordinary meeting was held at which a resolution was passed empowering the Directors to raise further capital not exceeding £6000, by the creation of new ordinary shares of £10 each.

Derwent Valley Water Board.—At a meeting of this Board last Thursday, the Clerk reported that he attended an inquiry at Hope on March 1 with reference to the application of the Chapel-en-le-Frith Rural District Council for the sanction of the Local Government Board to a loan to sink wells and construct other water-works for the supply of Hope. The Clerk, on behalf of the Derwent Board, opposed the application, on the ground that Parliament had granted them power to impound the waters at or above the embankment of the Bamford reservoir as would or might be intercepted by the works authorized by the Derwent Valley Water Act. The Board confirmed the action of the Clerk, and appointed a deputation to wait upon the Local Government Board on the matter, and also resolved to petition them in regard to the application. The Clerk also reported that, owing to the decease of Mr. G. J. Symons, one of the Referees appointed by the Derwent Valley Water Act for the ascertainment of rainfall for purposes of compensation water, it was necessary to make application to the President of the Institution of Civil Engineers to appoint a successor. The Board subsequently considered 34 applications for the appointment of Engineer, and selected the following gentlemen to meet the Board: Mr. E. Sandeman, of Plymouth; Mr. A. W. Stansfield, of Skipton-in-Craven; Mr. R. H. Wyrill, of Swansea; and Mr. M. Ratcliffe Barnett, of Brecon.

The Aberdare District Council and their Reservoir Contractor.—At the ordinary meeting of the Aberdare District Council last Tuesday, the Chairman (Mr. D. P. Davies, J.P.) stated that their Clerk was in Scotland receiving the cheque and handing over the documents in connection with their claim against the late Contractor in reference to his failure to complete the new reservoir. As the matter was now closed, he was pleased to give a brief account of the settlement. Mr. Brebner, who took the contract, failed in May, 1897, to carry it out, and left the puddle trench in a very dangerous condition. Their Surveyor at once took steps to re-timber it, and carried this difficult job through without a hitch. Mr. Brebner tried to get an injunction to prevent them going on to the ground; but though he actually carried it to the Court of Appeal he lost in both Courts. The Council unfortunately had been unable to get their costs. He then brought a claim against the Council for £8000; but, after negotiations, the matter was settled—not by the Council paying a penny to Mr. Brebner, but by him and his trustees and sureties handing over to the Council £3081. The Council had now reservoirs which were capable of holding 120 million gallons of water, and were sufficient to supply the needs of the district for at least the present generation.

The Davis Gas Stove Company, Limited, held an exhibition of gas cooking stoves and apparatus last week at Eastville, Bristol, in connection with the Bristol Gas Company. Miss Amy Wilkinson conducted cookery demonstrations each afternoon and evening.

The profits for the year of the Eagle Range and Gas-Stove Company, Limited, amount to £11,545. The Directors propose to pay on the preference shares a dividend of 6 per cent., including the interim dividend already paid, and on the ordinary shares 20 per cent., including the interim dividend, free of tax; together with a bonus of 1s. per share, also free of tax.

Messrs. Richmond and Co., Limited, have been holding gas exhibitions, with lectures on cookery, at Pendleton, Eccles, Longsight, and Warrington. At the Warrington Arts and Crafts Exhibition, their "Model" cookers have been awarded a gold medal for economy in use and general excellence of manufacture; and their display has been attended by very satisfactory results.

The New Sunlight Incandescent Company have just completed an installation of 150 lanterns and lamps, complete with their incandescent burners, at Drogheda, where the Sunlight white mantles are stated to be giving great satisfaction. We are informed that these mantles are also being largely used for street lighting in Liverpool, Birkenhead, Dublin, Glasgow, and many of the largest cities.

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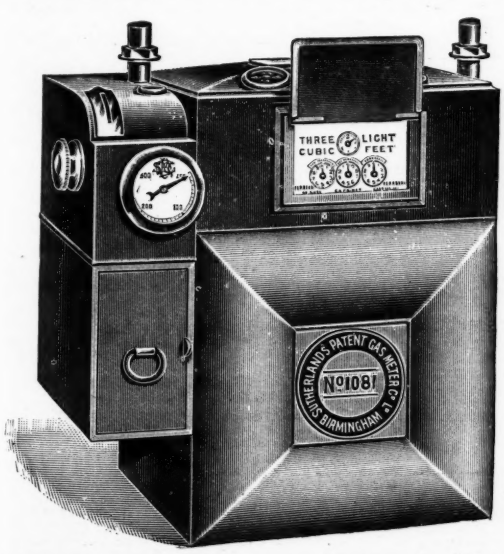

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PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BENZOL, specially made for the Enrichment of Gas.

ELLISON AND MITCHELL, LIMITED, Kilnhurst, near ROTHERHAM.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.

MELROSE CYCLE COMPANY, COVENTRY.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.

Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ENRICH your Gas with cheap Benzol.

Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER AND CO., MIDDLESBROUGH.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.

Information and Handbook on application,
70, CHANCERY LANE, LONDON, W.C.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.

Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."

[For Illustrated Advertisement, See p. 898.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

TO GAS COMPANIES AND CORPORATIONS.

IMPROVED CARBONIZING RESULTS.

A PRACTICAL Gas Engineer of 25 Years' Experience in both London and Provincial Gas-Works is open to VISIT GAS-WORKS, and ADVISE and REPORT upon the Best Methods in Working, by which the very best Results may be obtained. Gas-Works Managed *pro tem.* Terms moderate.

Address No. 3459, care of Mr. King, 11, Bolt Court, FLEET STREET E.C.

THE Vacancy for a Working Manager at a small Works in the Midlands (advertised last and the previous week) HAS BEEN FILLED UP. The Advertiser (Mr. Arthur Graham) thanks the numerous applicants (over 100).

MECHANIC requires a Situation as FOREMAN over Fitters, Turners, &c. Home or Abroad. First-Class Experience.

For References and Particulars, address No. 3466, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Draughtsman, experienced in Designing and Detailing Gas Apparatus.

Apply to R. DEMPSTER AND SONS, LIMITED, ELLAND.

WANTED, a Gas-Works Fitter, competent to lay Mains and Services, fix Slot Installations and Stoves. Wages 30s. per week.

Apply, with References, to the MANAGER, Gas-Works, DORKING.

WANTED, by a Firm of Gas Engineers, a DRAUGHTSMAN accustomed to Elevating and Conveying Machinery.

Apply, by letter, to No. 3465, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN Wanted for Constructional and General Engineering. One used to Elevating and Conveying Machinery for Gas-Works preferred. State Age, Experience, and Salary required.

WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Miles Platting, MANCHESTER.

WANTED, at once, a Gas-Fitter, to fit up Houses on the Prepayment System; also to make himself generally useful on the District. Wages 30s. per week.

Apply, by letter, stating Age and Experience, to A. H GODWIN, Manager, Gas-Works, WATFORD.

WANTED, at once, for a small Gas-Works, a steady Man as STOKER. Must be used to Shovel Charging and Engine and Exhauster. Wages in Summer 25s.; in Winter 28s. A permanency to a good Man. Reference required.

Apply to the MANAGER, Gas-Works, Chepstow, MON.

FINEDON GAS COMPANY, LIMITED.

WANTED, by the Directors, a thoroughly qualified MANAGER for their Gas-Works. (Make about 10 millions per annum.)

Applicants to state Age, Experience, and Salary required (House, Gas, Coal, and Garden provided), and to send in written applications, on or before April 9, to J. T. HAWTHORN, Esq., Chairman, Finedon, NORTHS.

WANTED, immediately, a Man to take charge of a Works making about 8 Millions per Year. One accustomed to Regenerative Settings, Exhauster and Engine. Would also be required to fix and read Meters, and if able to do Fitting generally would be preferred. Cottage on Works, with some Garden, Gas, and Coals free.

Apply, stating Wages required, to MANAGING DIRECTOR, Gas-Works, Witney, OXON.

TORQUAY GAS COMPANY.

WANTED, at once, a thoroughly good Man to act as FOREMAN of DISTRIBUTION DEPARTMENT. He must be well up in Main and Service Laying, and competent to take charge of, and direct, Workmen.

House Rent Free.

Applications, with *copies* of Testimonials, Particulars of Experience, and stating Age, whether Married or Single, and Wages required, must be sent to the undersigned.

ROBERT BEYNON,
Engineer and Manager.
Gas-Works, Hollacombe, Paignton.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application
No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

CITY OF BRADFORD.
(GAS DEPARTMENT.)

WANTED, an Experienced Draughtsman.

Apply, by letter, stating Age and Salary expected, to
CHAS. WOOD,
Engineer and Manager.

1899 Letter W. No. 9925.

IN THE CHANCERY OF THE COUNTY PALATINE OF LANCASTER, MANCHESTER DISTRICT.

WALMSLEY *v.* CLAY.

VALUABLE ENGLISH and FOREIGN PATENTS for Shock Proof Anti-Vibratory Fittings for Incandescent Gas Lighting, Tools, Accessories, Stores, and Effects at the Works and Premises 14, Johnson Street, Bolton.

LOMAX SONS & MILLS will Sell by AUCTION (pursuant to an Order of the Court dated the 4th day of December, 1899, and with the approbation of the Registrar of the Manchester District of the said Court) at the Public Sale Rooms, Bowker's Row, Bolton, on Thursday, the 5th day of April, 1900, at Seven o'clock in the Evening, subject to conditions—

LOT 1—"COILED PIPE" ANTI-VIBRATOR PATENT, being an improvement in, and connected with, the Burners for neutralizing the effects of Shock and Vibration on Mantles used in Incandescent Gas Lighting:

No. 6874, dated March 30, 1896. Also the patents in Germany, Belgium, Victoria, New South Wales, France, New Zealand, South Australia, Tasmania, Austria, Canada, Norway, United States of America, and Queensland for the same Invention.

"ARRESTER" PATENT for Bye-Pass Burners, which prevents Bearings from being pulled out of position, and also prevents the Coil from being strained:

No. 24,899, dated Nov. 2, 1896. Also the Patents in Germany and United States of America for the same Invention.

Together with the Fittings and Accessories appertaining to the said Patents.

LOT 2—"CANTILEVER" ANTI-VIBRATOR PATENT:

No. 27,827, dated Dec. 7, 1896. Also the patents in Norway, Sweden, Germany, Belgium, Victoria, South Australia, New South Wales, France, Tasmania, Canada, New Zealand, Queensland, and United States of America for the same Invention.

Together with the Fittings and Accessories belonging thereto.

LOT 3—The Tools, Stock-in-Trade, Stores, Office Furniture, Photographic Apparatus, Stationery, Fixtures and Effects comprising Bench and Brest Drilling Machines, Screwing Tackle, two Parallel Vices, Circular Saw, Grindstone, two Gas-Pressure Gauges, Foot Bellows, Joiners' Tools, Benches, Tables, Store Racks, Partitions, Packing Cases, 970 lbs. of Copper Tubing, Scrap Copper, Brass, and Lead, German Silver Wire, Pipe Fittings, Arc and Street Lamps, Works Lanterns, Fredureau Globes, Incandescent Burners, Mantles, Chimneys, Reflectors, Mahogany Pedestal Writing-Desk, Walnut Book Cupboard, Fireproof Safe, 30 in. by 22 in. by 22 in. (by John Crook) and Stand, Letter Copying-Press, Four-Lap Screen, Desk and Single Chairs, Corticine Floor Cloths, one Camera by Middlemiss, with Accessories, Books, Stationery, &c.

SCHEDULE of the Fittings and Accessories included in the Sale of the Patents and Inventory of the Tools, Stock-in-Trade, Stores and Effects will be produced at the time of sale, or may be inspected Seven Days prior to sale, and further Particulars had at the Chancery Office, Duchy Chambers, 4, Clarence Street, Manchester, on application to the Auctioneers, Central Chambers, Bolton (Telephone 181), and 54, John Dalton Street, Manchester (Telephone 3668); Mr. Samuel Greenhalgh, Chartered Accountant, Acresfield, Bolton; Messrs. Winders, Solicitors, Bowker's Row, Bolton; Messrs. Russell and Russell, Solicitors, 11, Wood Street, Bolton; Messrs. Boote, Edgar, and Co., Solicitors, 18 and 20, Booth Street, Mosley Street, Manchester; or to

Messrs. J. PHETHEAN MONKS AND CO.,
Solicitors,
Central Chambers,
Fold Street,
Bolton.

COUNTY BOROUGH OF WALSALL.
(GAS DEPARTMENT.)

THE Corporation of Walsall require the services of a competent and experienced GAS ENGINEER and MANAGER for their Gas-Works. He must be capable of designing and superintending the carrying out of Extensions of the Works, and competent to undertake the entire control of the Works and the supervision of the Manufacture of Gas.

Salary £500 per annum. The appointment to be subject to Three Months' Notice on either side.

A statement of Duties can be obtained from the undersigned, to whom applications, marked outside "Gas Engineer and Manager," accompanied by not more than three Testimonials, are to be sent on or before Saturday, the 14th of April, 1900.

Canvassing either directly or indirectly any Members of the Council will be considered a disqualification.

JOHN R. COOPER,
Town Clerk.

Town Clerk's Office, Walsall,
March 24, 1900.

WANTED, a Second-Hand Station METER, capacity 30,000 to 40,000 cubic feet per hour. Also Second-Hand ENGINE and EXHAUSTER combined, capacity 15,000 cubic feet per hour. Must be in good condition.

Particulars by letter, addressed to No. 3467, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CONDENSER (Morris & Cutler's), 21 ft. 6 in. by 6 ft. 6 in. by 3 ft. 6 in., 1 million per day. Equal to new. Exceptional Bargain, if sold promptly.

Address No. 3463, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF HULL WATER AND GAS DEPARTMENT.

GAS PLANT FOR SALE.

RETORT-HOUSE FITTINGS—Retort- FITTINGS for 120 Round Retorts, 16 inches diameter, Wrought-Iron Lids, Screws, and Cross-Bars, 7 inch to 5 inch and 6 inch to 4 inch Ascension, Arch, and Dip Pipes.

One HYDRAULIC MAIN ⊃ shape, 31 ft. by 18 in. by 18 in.

One HYDRAULIC MAIN ⊃ shape, 41 ft. by 18 in. by 18 in.

Thirteen HYDRAULIC MAINS ⊃ shape, 6 ft. 9 in. by 16 in. by 16 in.

Thirteen 6-inch SEAL-VALVES.

9-inch and 10-inch CAST-IRON FOUL-MAINS.

40 yards of 15-inch STEEL FOUL-MAIN.

CONDENSERS—

Set of six Cast-Iron ANNULAR CONDENSERS Outer Tube 2 feet, Inner Tube 10 inches, with Inlet and Outlet Valves and Bye-Pass.

TAR-EXTRACTOR—

Patent CARBONIC ACID and TAR EXTRACTING WASHER, by C. & W. Walker, for 500,000 cubic feet per day, 12-inch Valves and Bye-Pass.

WASHER—

One WASHER by Kirkham, Hulett, and Chandler for 500,000 cubic feet per day, with Steam-Engine, 10-inch Valves, and Bye-Pass complete.

PURIFIERS—

One set of Four PURIFIERS, 15 feet square, 4 feet deep, with Centre-Valve, and 15-inch Connections, Columns and Girders for fixing on first floor, together with Lifting Tackle.

One set of Two PURIFIERS, 15 feet square, 4 feet deep, with Centre-Valve, and 15-inch Connections. Columns and Girders for fixing on first floor, together with Lifting Tackle.

EXHAUSTERS AND STEAM-ENGINES—

Two 30,000 cubic feet per hour EXHAUSTERS and ENGINES, nearly new, by George Waller and Co.

12-inch Automatic BYE-PASS.

3-inch THROTTLE VALVE.

3-inch improved COMPENSATING GOVERNOR.

Two patent STEAM COMPENSATING GOVERNORS.

12-inch CONNECTIONS complete.

BOILERS—

Two Steel CORNISH BOILERS, 16 ft. by 5 ft. 6 in., with Galloway Tubes, Mountings complete for 70 lbs. pressure.

GASHOLDERS—

One THREE-LIFT GASHOLDER, about 71 feet diameter by 20 feet deep. Wrought-Iron Standards, Girders, Valves, and Connections.

One TWO-LIFT GASHOLDER, about 49 feet diameter by 18 feet deep. Cast-Iron Columns, Girders, Valves, and Connections.

Two TWO-LIFT GASHOLDERS, 46 feet diameter by 18 feet deep. Cast-Iron Columns, Girders, Valves, and Connections.

STATION METER—

STATION METER, to pass 30,000 cubic feet per hour.

GOVERNORS—

14-inch and 6-inch GOVERNORS.

PUMPS—

Various STEAM, TAR, LIQUOR, and WATER PUMPS.

GAS-ENGINE—

12-Horse Power by Crossley Bros.

VALVES—

DONKIN and other VALVES.

The above-mentioned Machinery, &c., may be seen on application to the undersigned.

Offers for the whole, or any part, of the Plant to be addressed to the Chairman of the Water and Gas Committee, and delivered to the Office of the Town Clerk, Hull.

By order,
F. J. BANCROFT,
Water and Gas Engineer.

TWO complete Circles of Side Plates FOR SALE, forming CAST-IRON TANK, 26 feet diameter by 6 feet deep, Metal ¾-inch thick, Caulked Joints. Sketch on application.

Offers per ton on Truck in Surrey invited by JAS. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C., until April 16.

FOR SALE—Two Lancashire Boilers, each 6 ft. diameter by 20 ft. long, with Mountings. Been in use only a short time. Made by the Yorkshire Engine Company, Limited, Sheffield.

Apply to NEWTON, CHAMBERS, & Co., LIMITED, Thorncliffe Iron-Works, near SHEFFIELD, where the Boilers may be seen.

EXHAUSTERS, 1500 to 60,000 feet per hour, with or without Engines.

LIVESEY WASHERS, CUTLER CONDENSER, SCRUBBERS, 5 feet and 6 feet diameter, METERS, GOVERNORS, PURIFIERS (Sets of 6 feet and 10 feet square), BOILER and other TANKS, VALVES, &c., J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SMALL EXHAUSTER FOR SALE.

GWYNNE and BEALE Patent Gas EXHAUSTER and ENGINE combined, with Steam-Boiler, and all Connections complete, as now at Work, passing up to 10,000 cubic feet. In good order, and only sold to make room for a larger one.

Apply to J. C. ARCHER, Gas Company, BRIDLINGTON.
April, 1900.

FOR SALE—Gas-Works Plant complete, except Stone and Brick Buildings. The entire Works must be moved at once; and under these circumstances will be sold at the low Price of £350, including Purifiers, Station Meter, Gasholder, Governor, &c., capable of manufacturing 1 million cubic feet per month.

Apply to CHARLES D. PHILLIPS, Emlyn Works, Newport, MON.

THE Corporation of Liverpool have for DISPOSAL a large number of Modern 14-inch Square LAMPS, Copper built throughout, with plain Glass Sides, and Opal Glass Tops, for use in Cradles or on Legs. They are in good repair; a large number of them being practically equal to new.

A Sample will be sent on application, and a Low Price accepted.

C. R. BELLAMY,
City Lighting Engineer.

Hood Street, Liverpool.

HOLMFIRTH GAS COMPANY.

"ECLIPSE" WASHER-SCRUBBER FOR SALE.

FOR SALE—An "Eclipse" Washer- SCRUBBER, in very good Condition, with 8-inch Connections, capable of passing 200,000 cubic feet of Gas per day. Can be seen working at the Holmfirth Gas-Works. The above Washer was thoroughly overhauled and repaired by the Makers in 1899.

Offers are invited for the above.

Further Particulars may be obtained from
HUBERT RUSSELL,
Manager.

Gas Company, Holmfirth, Yorks.,
March 28, 1900.

COCKERMOUTH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR A NEW OR SECOND-HAND GAS-ENGINE AND EXHAUSTER.

THE Gas Committee of the above Council are prepared to receive TENDERS for the supply of a 1-horse power GAS-ENGINE. Also a ROTARY EXHAUSTER capable of passing 10,000 cubic feet per hour.

Combined or separate Tenders invited.

Prices to be for the Machinery delivered at Cockermouth.

The Committee do not bind themselves to accept the lowest or any other Tender.

Tenders to be sent to me not later than April 12, 1900.

HAROLD BAKER,
Engineer and Manager.

Gas-Works, Cockermouth,
March 29, 1900.

SOUTHEND GAS COMPANY.

TENDERS FOR COALS.

THE Directors of the above Company invite TENDERS for the supply of 10,000 (Ten Thousand) Tons of either Best Unscreened SILKSTONE or DURHAM GAS COALS.

To be delivered at the Railway Station, Great Eastern Railway, or London, Tilbury, and Southend Railway, Southend, or alongside opposite the Company's Works, during the period of Twelve Months between June 1, 1900, and May 31, 1901, in quantities from time to time as the Engineer shall direct.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Any further Particulars can be obtained by making application to the Engineer (Mr. Frank Clark).

Sealed Tenders, to be addressed to the Chairman, endorsed "Tender for Coal," at the Offices of the Company, not later than the 14th day of April next.

By order,
JAS. T. RANDALL,
Secretary.

Offices: No. 52, High Street,
Southend-on-Sea, March 31, 1900.

ROTHERHAM CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the RE-SETTING of Six SETTINGS of INCLINED RETORTS.

Particulars may be obtained on application to the Engineer (Mr. F. A. Winstanley), Gas Offices, Bridgegate.

Endorsed Tenders must be delivered to the undersigned on or before Saturday, April 14, 1900.

H. H. COPNALL,
Town Clerk.

March 23, 1900.

NEW MILLS URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TO GASHOLDER MAKERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for—

1. Telescoping GASHOLDER, with Outer Lift, 63 ft. diameter by 20 ft. deep, with Guide-Framing.
2. RETORT SETTING and FIRE-CLAY GOODS.

Plans and Specification can be seen, and all Information obtained, from Mr. Edward Jones, Gas Engineer.

Tenders, endorsed "Gasholder," or "Retorts," as the case may be, to be sent to me, the undersigned, not later than April 21, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

JOSEPH POLLITT,
Clerk to the Council.

Town Hall, New Mills,
March 26, 1900.

LIVERPOOL UNITED GASLIGHT COMPANY.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of a quantity (not exceeding 15,000 Tons) of OIL, suitable for the manufacture of Carburetted Water Gas.

The Oil is to be delivered between the 1st of June, 1900, and the 30th of June, 1901.

Specification and full Particulars may be obtained on application to the undersigned, to whom Tenders must be delivered on or before Wednesday, the 18th of April, 1900.

WILLIAM KING,
Engineer.

Gas Office,
Duke Street, Liverpool,
March 21, 1900.

LIVERPOOL UNITED GASLIGHT COMPANY.

TENDERS FOR CANNEL AND COAL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 140,000 Tons of CANNEL, and 140,000 Tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months, between the 1st of July, 1900, and the 30th of June, 1901.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Tenders (on the printed Form only) must be delivered, at or before Ten a.m., on Wednesday, April 18, endorsed "Tender for Cannel and Coal."

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street,
Liverpool, March 28, 1900.

TENDERS FOR PURIFIERS AND STATION METER.

THE Urban District Council of Hindley invite TENDERS for the supply and erection at the Gas-Works, Hindley, of Four PURIFIERS, 20 ft. by 20 ft. by 5 ft., with 16-inch Connections and Centre-Valve, complete with Lifting Apparatus, Rails, &c.; also One STATION METER, capacity 25,000 cubic feet per hour.

Sealed Tenders, endorsed "Tender for Purifiers," and "Tender for Station Meter," accompanied by Tenderer's own Plans, Specifications, and full Particulars, to be delivered to the undersigned not later than Twelve o'clock noon, April 17, 1900.

The Council do not bind themselves to accept the lowest or any Tender; and persons Tendering must do so at their own cost.

By order,
STEPHEN HOLT,
Clerk.

Hindley, March 29, 1900.

THE Urban District Council of Hindley are prepared to receive TENDERS for the supply of

360 12-inch Spigot and Socket CAST-IRON GAS-PIPES;
8 12-inch SYPHON POTS;
12 SURFACE BOXES;
2 Tons SPECIAL PIPES;
3 Tons SOFT PIG LEAD; and
1 12-inch GAS GOVERNOR, with Bye-Pass and Valves complete.

Specifications with Forms of Tender can be obtained on application to Mr. Wm. Dickinson, Gas and Water Manager.

Sealed Tenders, endorsed "Tender for Gas-Pipes, &c.," to be lodged with the undersigned not later than Twelve o'clock noon, on Tuesday, the 17th day of April, 1900.

By order,
STEPHEN HOLT,
Clerk to the Council.

Council Offices, Hindley,
March 29, 1900.

FELIXSTOWE GASLIGHT COMPANY LIMITED.

TENDERS FOR COAL.

THE Directors of this Company are prepared to receive TENDERS for 1500 Tons of GAS COAL, delivered either at the Felixstowe Dock or the Beach Station, Felixstowe, G.E. Railway, between May 1, 1900, and April 30, 1901.

Sealed Tenders, marked "Tender for Coal," should be sent to the Chairman not later than April 19.

The lowest or any Tender not necessarily accepted.

W. V. WATSON,
Secretary and Manager.

ALDERSHOT GAS AND WATER COMPANY.

THE Directors of this Company are prepared to receive TENDERS for the supply of 20,000 Tons of GAS COAL and 500 Tons of CANNEL, for delivery from July 1, 1900, to June 30, 1901.

Copies of Specification and Conditions can be had on application to the undersigned.

Sealed Tenders, endorsed "Tenders for Coal," should be sent to me not later than Five p.m., May 9, 1900.

The Directors reserve the right not to accept the lowest or any Tender.

By order,
R. W. EDWARDS,
Secretary.

General Offices, Aldershot,
March, 1900.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Supply, Erection, Completion, and Setting to Work of a PLANT at their Bradford Road Gas Station, for the MANUFACTURE OF SULPHATE OF AMMONIA and the PRODUCTION OF SULPHURIC ACID.

Full Particulars and Specification may be obtained, and Plans inspected, on application to Mr. J. G. Newbigging, Engineer, Rochdale Road Gas-Works, Manchester.

Tenders, endorsed "Tender for Sulphate Plant," to be addressed to the Chairman of the Gas Committee, must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 26th day of April, 1900.

The Corporation do not bind themselves to accept the lowest or any Tender.

WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
March 30, 1900.

URBAN DISTRICT COUNCIL OF HAVERHILL.

TENDERS FOR COAL.

THE above Council invite Tenders for the supply of 1200 Tons of the best screened SILKSTONE GAS COAL, to be delivered free at Haverhill Station during the period of One Year, or less, at the option of the Council, from the 1st day of May next. Delivery will be taken from time to time as the Manager shall require the same.

The Council reserve the right to accept the whole or any portion of the said quantity, or to divide the Contract, and do not bind themselves to accept the lowest or any Tender.

The person whose Tender is accepted will be required to enter into the usual contract for due performance thereof.

Tenders, in sealed envelopes, endorsed "Tender for Coal," should be addressed, and sent to me, the undersigned, not later than the 10th day of April next.

No special form of Tender issued.

By order,
SIDNEY H. GRAHAM,
Clerk to the Council.

Haverhill, March 27, 1900.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,
THE HARTON COAL CO., LTD.,
NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THE Urban District Council of Atherton invite TENDERS (on or before Wednesday, April 11) for the supply, during Twelve Months from the 1st of June next, of 6000 Tons of screened GAS COAL or NUTS.

Forms of Tender and further Information may be had on application to

D. SCHOFIELD,
Clerk.

Atherton, March 21, 1900.

ILFORD GAS COMPANY.

THE Directors of the Ilford Gas Company are prepared to receive TENDERS for the supply and erection of a THREE-LIFT GASHOLDER, 156 feet diameter by 35 feet deep, on Land adjoining the Company's Works, Ilford, Essex.

Drawings, Specifications, and Forms of Tender may be had on payment of Two Guineas (not returnable), on application to the undersigned, from whom any further Information may be obtained.

Tenders, endorsed "Gasholder," to be sent in to the above Works, addressed to John Denney, Esq., Secretary, Ilford Gas Company, Gas-Works, Ilford, on or before Monday, the 23rd inst.

J. H. BROWN,
Engineer.

Gas-Works, Ilford, E.,
April 4, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LEA BRIDGE DISTRICT GAS COMPANY.

NEW ISSUE OF
£10,000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 24th of April, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

HOLMSIDE GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16$\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) 13$\frac{1}{2}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

BATHGATE GASLIGHT COMPANY.

THE Directors invite Tenders for Coal, as under, for the Year from the 1st of May, delivery as required—

Best CANNEL, 300 Tons; SPLINT COAL, 800 Tons.

Also for TAR and AMMONIACAL LIQUOR made at their Works during the Year from the 15th of May next.

Offers to be lodged with the Secretary on or before Monday, the 9th of April.

The Directors do not bind themselves to accept any Offer.

NELSON CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR CAST-IRON MAINS AND SPECIAL CONNECTIONS.

THE Gas Committee invite Tenders for the supply and delivery of CAST-IRON MAINS and SPECIAL CONNECTIONS for their Brierfield Works.

Full Particulars may be obtained on application to Mr. A. Allan, Gas Engineer, Nelson.

Sealed Tenders, marked "Tender for Cast-Iron Mains and Special Connections," to be sent to me, the undersigned, not later than April 12, 1900.

R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
March 27, 1900.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

GAS ENGINEERS' AGENTS AND CONTRACTORS FOR
Meters, Fire-Clay Goods, Oxide of Iron, and all other Gas Apparatus. Retort Carbon purchased.

Inquiries Solicited.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·83 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

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MANUFACTURERS OF GASELIERS IN GLASS AND METAL.

TROTTER, HAINES, & CORBETT,
Bretteli's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad Street, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, near DEWSBURY.

JAMES OAKES & CO.
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

LONDONDERRY GAS COALS
FROM THE
LONDONDERRY COLLIERIES,
COUNTY OF DURHAM.
Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

For Prices and Particulars, apply to
S. J. DITCHFIELD,
SEAHAM HARBOUR,
COUNTY OF DURHAM.

HARDMAN & HOLDEN, Ld.
ESTABLISHED 1820.
SULPHURIC ACID.
GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.
Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND,
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

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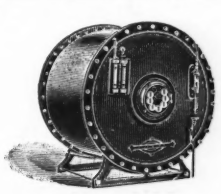
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.



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WITH SELF-SEALING LIDS FOR
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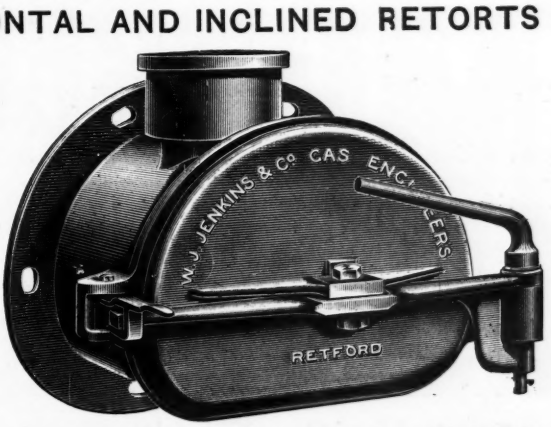
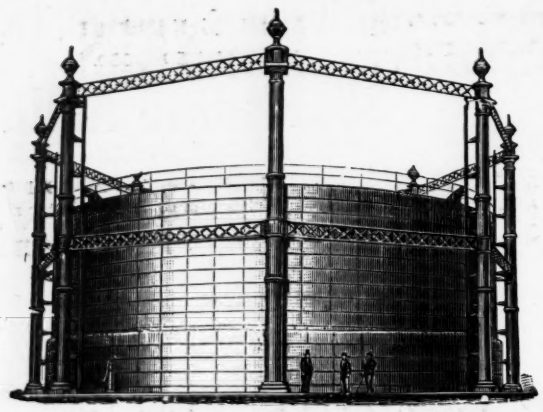


W. J. JENKINS & CO., LTD., RETFORD.



PORTER & CO.,

GAS ENGINEERS,

MANUFACTURERS, IRONFOUNDERS, & CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

Telegraphic Address: "PORTER LINCOLN." National Telephone, No. 13.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

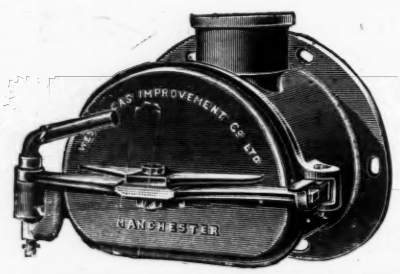
References to 600 Works already erected.

N.B.—All Communications to be addressed to the FIRM ONLY.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER;

AND 104, QUEEN VICTORIA STREET, LONDON, E.C.



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WEST'S PATENT REGENERATOR SETTINGS.

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RETORT MOUTHPIECES WITH SELF-SEALING LIDS.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD,

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

Gas Engineers and Contractors.

BALE & HARDY, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

CHIMNEYLESS INCANDESCENT BURNERS.

NEW SUNLIGHT INCANDESCENT COMPANY

LIMITED.

WE HEREBY GIVE NOTICE that our **DE MARE PATENT** has now been finally amended, notwithstanding the strenuous opposition of the Welsbach Incandescent Gas Company, and the claims are settled beyond appeal, as follows :—

1. In Incandescent Gas-Burners wherein the light is obtained by means of a radiant tissue, an ejector **having the form of two cones united at their summits** and placed beneath the air chamber and immediately over the cone from which the Gas issues.

2. The right to employ any form of Incandescent Burner deemed suitable, while retaining the two cones substantially as described.

We claim that this patent is a **Master Patent** for Incandescent Burners "having the form of two cones united at their summits;" and proceedings have long since been commenced by us against the Welsbach Company, as makers and sellers of the

KERN BURNER

which embodies this form. In the event of our succeeding in this Action, we shall be in a position to follow all such Burners into the hands of their actual users, **and to require their delivery up or destruction.** That is why we give this emphatic warning to all Dealers and Users to beware of investing their money in Burners infringing our Patent, the sale or use of which will render them liable to an Action for Damages for the Infringement of our Patent, and delivery up and destruction of the goods. Besides, our

SIMPLEX BURNER

gives better results, and **costs less money,** with no risk to the seller or user.

In view of the above complications, we are prepared to make a very liberal offer to our Customers :—

For two months from this date any user of Kern Burners can have them **exchanged** by us without expense **for our Simplex Burners** on promise to pay for the latter if and when the Court shall decide the Kern to be an Infringement of our Patent.

New Sunlight Incandescent Co., Ltd.,

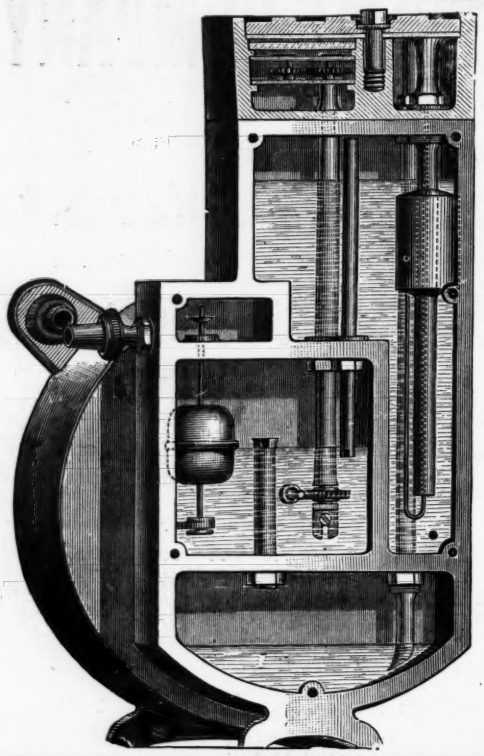
33 & 34, SHOE LANE, LONDON, E.C.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT
UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

OVER 60 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **Seven Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas and Oils suitable for the Enrichment of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

THE

"KITSON" LIGHT

A REVOLUTION IN LIGHTING.

Highest Award, Medal and Diploma

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NATIONAL EXPORT EXPOSITION, PHILADELPHIA, U.S.A.

FOR PRICES AND PARTICULARS, APPLY TO THE

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REGISTERED OFFICE: 137, Victoria Road, DARLINGTON.

Telegrams: "Robustness, London." **RETORT-HOUSE, SETTINGS, & RAILWAY** Telephone: No. 756 Bank.

IN COURSE OF ERECTION BY OUR OWN WORKMEN.

Plans, Estimates, and Specifications prepared and submitted.

Special Facilities for RECONSTRUCTING GAS-WORKS.

CONDENSERS, SCRUBBERS, WASHERS, EXHAUSTERS, TANKS, and every REQUISITE.

A SPECIALITY.

INCLINED and FLOOR-LEVEL SETTINGS, with or without REGENERATIVE or GENERATOR FURNACES, with or without IRONWORK. COMPLETE RE-SETTING.

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PATENT REGENERATIVE FURNACES

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Designs and Estimates on Application.

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THOMAS BUGDEN,

Manufacturer of

Bellows for Inflating Gas-Bags. Made in various sizes.

Bellows made to inflate a 48-inch Bag under One Minute.

Miners' Woollen Jackets.

India-rubber Hose, Sheet, and Washers of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats, Capes, and Sewer Boots.

Stokers' Mitts, from 14s. doz.

Special Air Tubing made for Gas Companies.

Gas-Bags for Mains.

71, GOSWELL ROAD, E.C., AND AT
256, PENTONVILLE ROAD, KING'S CROSS, N.

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Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Makers of Self-Emptying Saturators.

Write for Particulars, Testimonials, and References to

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MIDDLESBROUGH-ON-TEES.

MAURICE GRAHAM. Telegrams "ACCOUPLE" LEEDS.

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Works; BLACK BULL STREET, LEEDS.

ESTABLISHED 1844. ORIGINAL MAKERS. ESTABLISHED 1844.

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THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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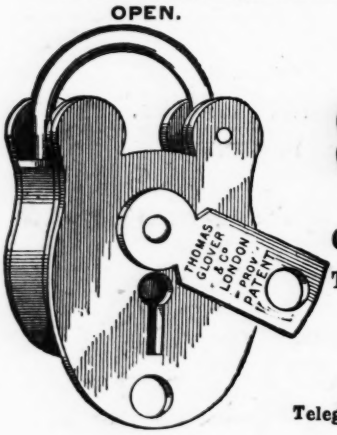

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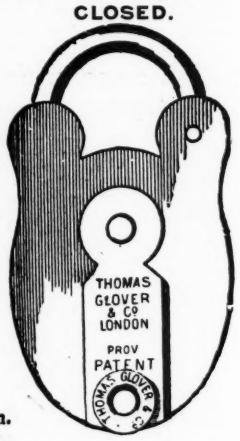
SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark.
Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1868.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address:* "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 3398.

GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
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WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

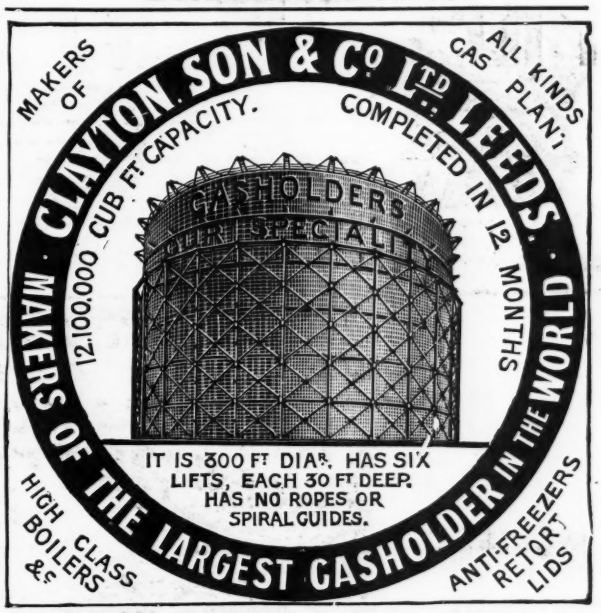
MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
SPECIALITY
IT IS 300 FT DIAM. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
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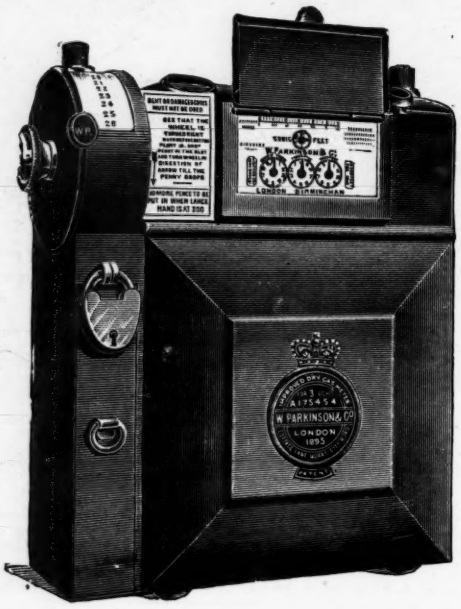

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[See also Advt. p. 854.

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